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The Necessity for Selection Continues

While the railway situation is changing with startling rapidity, the effect on the maintenance of way department is in general the same in at least one respect since it is still necessary to separate the essential from the less essential work. Prior to 1916, low earnings made it necessary to curtail expenditures. In 1917 and particularly in 1918 the shortages of labor and of material required the selection for preferred attention of that work most necessary to keep trains running. Now that men and materials are again becoming available the necessity for rigid economy in expenditures again suddenly appears. All of these changes have the one effect on the maintenance of way supervisor and foreman of requiring him to consider each piece of work carefully and in relation to the other problems confronting him, in order to determine its relative importance so he may first do that work most necessary for the maintenance of traffic and leave for deferred attention, those details which, while necessary, are not as important as the others.

The Condition of Wooden Bridges

A discussion on another page, of the conditions affecting the determination of renewals on timber structures draws attention to a very old problem, for wood is the oldest of structural materials. Timber occurs in such a variety of species and with such gradations of physical qualities that it requires no little knowledge to pass on the strength of new timber structures. With the deterioration occurring with age, the problem become increasingly complex. The advancement of knowledge of the physical properties of wood during recent years has made it possible to pass more intelligently on the ability of bridges to carry the loads imposed upon them. However, technical knowledge cannot take the place of actual contact with the material in the field—it is only by long experience that a man may develop the quality of judgment essential to pass accurately on the condition of timber bridges and trestles. This judgment must be exercised with painstaking care. There is no substitute for a detailed examination of the complete structure, although much depends upon the experience and ability of the inspector. There are, however, certain principles which govern the examination of bridges and trestles, a knowledge of which is of considerable value to those who do this work.

Saving the Cement Sacks

The loss of a single cement sack, even at the present price of 25 cents, is in itself insignificant in comparison with the magnitude of railway operations. Yet when a road handles 200,000 to 500,000 sacks annually (and a number of the larger roads exceed these figures) the investment is large and the opportunities for loss are correspondingly great. It is because of a realization of this fact that a number of the roads have inaugurated methods for insuring the return of these sacks as described in the last issue. The possibility of reducing losses to the minimum by such measures is exemplified by the results on the Burlington where 98 per cent of all the sacks issued are returned and accounted for. The attitude of the manufacturer towards this problem is indicated by an article in this

issue which describes the measures adopted to conserve sacks in a plant equipped to reclaim 150,000 of them daily. As was stated above, the loss of a cement sack is in itself small, but when one sees them destroyed needlessly on the job or worn as aprons or moccasins by the laborers in a concrete gang it requires only a small amount of figuring to ascertain the magnitude of the losses through such measures.

THE VICTORY LOAN

BEFORE ANOTHER issue of the *Railway Maintenance Engineer* appears we will be in the midst of another liberty loan—the final or Victory Loan. The campaign will open on April 21 and will close on May 12. In common with all citizens, every railway employee is under moral obligation to subscribe liberally to this loan. He should do it in a spirit of thankfulness that the conflict and bloodshed have been ended, and ended in our favor.

Railway men bear a special responsibility to these loans. Although large numbers of them participated directly in the fighting, the maintenance of uninterrupted transportation was so essential to our military success that many who would otherwise have joined our military or naval forces remained at home, where they performed valuable service for our country, but which at the same time did not call for the sacrifice or involve the danger incident to the trenches or the submarine zone.

The Railway Administration has presented an unusually favorable plan of co-operation for railway employees, whereby they can subscribe for the Victory Loan through the Federal treasurers of their companies, in which instances they can pay for their bonds in installments of 10 per cent monthly, with interest on the unpaid balances at the same rate as carried by the Victory Loan itself. In subscribing for these loans it should also be borne in mind that they are investments rather than contributions. One of the beneficial results of the war to the American people has been the promotion of the thrift habit. Many persons have purchased bonds from patriotic motives, who otherwise would not have saved the amounts invested or have had anything to show for their expenditures. The Victory Loan offers another opportunity to add to these savings, while at the same time enabling each citizen to contribute his share to the financing of the war.

RAILROAD ADMINISTRATION AIDS CONVENTIONS

ONE OF THE features which contributed most directly to the success of the convention of the American Railway Engineering Association last month was the support rendered by the United States Railroad Administration in encouraging interested railway men to attend the meetings. Similar support has been given to many of the other railway associations. As a result the attendance at these meetings has in general been far above normal, while the value of the discussions has been correspondingly increased and the information presented more widely disseminated than ever before.

The Railway Administration is entitled to the hearty commendation of railway men because of the marked impetus which its support has given to association work. No one familiar with the facts can fail to understand the importance of these associations to the railway men comprising their membership and to the roads which employ them, and it is to the credit of the Railroad Administration that those in charge of its policies have been quick to realize the educational value of these associations and to co-operate in promoting their interests. This co-operation should prove a tremendous incentive to the officers and members of committees of the different organizations to make their next meetings even more valuable than those of the past year.

A BREAK IN MATERIAL PRICES

THE FIRST important break in the prices of maintenance of way materials since the conclusion of the war came on March 25 when the steel manufacturers announced important reductions in quotations for their products, including a lowering in the cost of rails of $10 per ton. This has since been followed by similar decreases in the prices of spikes, bolts and other track fastenings.

We may, therefore, confidently feel that we are entering on an era of lower prices, marked by declines which will be gradual, but nevertheless important in comparison with war-time quotations. Coupled with the announcement of the cutting of prices was the statement that these revised quotations will stand for the year, so that there should be no further hesitation in placing orders with the hope that additional delay may result in still greater savings. Sufficient time has not yet elapsed to permit the full effects of this announcement to become evident. However, it will without doubt tend to stimulate general construction activity. Had it not been for the failure of passage of the revolving fund the railways would undoubtedly have responded quickly with orders for rails and track fastenings, long delayed, as well as for bridge materials, etc. Now that their demands for concessions in prices have been largely made, the delay in accepting these prices just reported will undoubtedly be temporary and limited only to the ability of the Railroad Administration to finance the needs of the roads. Maintenance and improvement work cannot be avoided but it must be done and each day's delay only makes it the more necessary.

MORE RECOGNITION OF THE MAINTENANCE DEPARTMENT

IN A LETTER to the editor on a following page, a correspondent decries the subordinate place accorded the maintenance of way department in the scheme of management as worked out on many roads. His chief objection is that the work in most cases is administered by division superintendents who "have never had any experience (in maintenance) until they were appointed division superintendent." This is an oft-cited objection to the divisional scheme of railway organization, and one not readily overcome where this plan is in effect. For if one man is to be supreme within his jurisdiction he must be the chief executive over all departments and it is not to be expected that he can have had an actual working experience in all branches of the service. It is not proper here to discuss the merits of the divisional or any other form of organization; it suffices to say that maintenance work is at a particular disadvantage only on those roads where the maintenance department is dwarfed through the absence of divisional maintenance officers competent and with authority to direct the work under the superintendent and of similar system maintenance officers with general supervision over all maintenance work under the general manager.

A new impetus has been given to the idea of a higher status for maintenance work since the advent of government operation through the appointment of a chief maintenance officer for the Railroad Administration and also for each of the seven regions. Special prominence is given to this fact in this issue by short sketches and

photographs of the maintenance officers of the Railroad Administration, published on pages 132 and 133. The fact that the men selected for these positions were in most cases chief engineers or assistant chief engineers of important railroads, indicates that it was the desire of the administration to secure men capable of high executive resposibility. The prominence now being given to maintenance of way work cannot but add to the importance of this branch of railway operation on those roads which have accorded it but scant attention in the past.

THE PRESENT MAINTENANCE SITUATION

MARCH is normally a month of active preparation for the season's maintenance and improvement work. This has been particularly true in recent years as the economy of starting the season's program during the early spring has come to be more generally realized. By April 1 plans on the more progressive roads are usually well developed and extra gangs are being organized or are at work. This year such work is practically at a standstill and no one knows what the season will develop as it advances. The most hopeful feature of the present situation is its very acuteness, which will force heroic measures.

A month ago the outlook for a normal year's work was favorable. While the roads under Federal control were earning a deficit, a bill appropriating money for essential improvements had been introduced in Congress and, in the absence of opposition, seemed certain of passage. Suddenly and without warning a filibuster developed in the late hours of the last Congress which prevented the passage of this and other appropriations. As a result the Railroad Administration has been left without funds to meet large obligations which it has already incurred, while a heavy deficit is accruing monthly. It has, therefore, inaugurated a more drastic program of retrenchment than was ever undertaken by the roads under private control and work is at a standstill at the very time when every effort should be made to expedite it.

The advocates of government ownership are deriving scant pleasure from the situation in which the roads are placed at the end of the first 15 months of Federal control. They have maintained that the railroads would be kept out of politics; yet the first piece of legislation presented to Congress for its consideration after the crisis of the war had passed failed of passage, not on its own merits, but to accomplish political ends. The economies possible through government operation have long been heralded, but the first year showed increased expenses of over $1,200,000,000, less than half of which was the result of increased wages, and in spite of the increases in freight and passenger rates, resulted in a deficit of $200,000,000. The reduction in accidents, the improvement in service to the public, the more systematic maintenance of the properties, etc., are other claims which have been advanced and which are likewise being exploded one by one.

Were it not for the seriousness of the present situation from the standpoint of the nation and the gross injustice which is being worked on the owners of the railroad properties, the irony of the present developments would be almost ideal. Fortunately it is only an experiment, to which the country is not committed as a permanent policy. In fact, the end appears to be in sight. In the meantime employees of the maintenance of way department owe it to the country and to the owners of the properties to do their best to maintain them in as good shape as possible until such time as conditions will permit their maintenance to prewar standards.

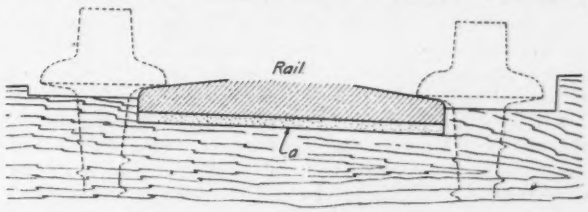
LETTERS TO THE EDITOR

FRENCH TRACK CONSTRUCTION

Utrecht, Netherlands.

TO THE EDITOR:

I have read the extract from the letter of Lieut. J. W. Kern in your November number, page 378, with great interest, as I have had the opportunity to study the French track work. On a visit to the "Chemins de fer de l'Est," some years ago, for instance, I saw how with their careful ways the French railway men were able to permit with safety the running of trains at 75 miles (120 km.)



Section Showing Adzing of Ties

an hour, on a track with rails weighing only 60 lb. per yard, and ties of which many were 30 years old.

I must correct your correspondent on one point, as he writes that ties are practically all of soft wood. The beech, which is used universally on the "Est," is a hard wood. The bearing surfaces of the tie are protected by small planks of poplar, about ⅜ in. thick. These are compressed to half the thickness before delivery so that the screw spikes may be screwed down directly to the proper depth, or nearly so.

With these means it is obtained that each tie remains firmly attached to the rail. The poplar strips take nearly all the wear. They are inspected and replaced regularly.

The attachment is so firm that the track does not creep, although rail anchors are not in use. The illustration shows the section to which the ties are adzed. The little plank of poplar is indicated by "a."

This type of construction of the track has been imitated successfully on the Netherlands State Railways, at a time when chairs could not be procured in sufficient number.

K. DEN TEX.

REPAIRING CEMENT SACKS

Chicago, Ill.

TO THE EDITOR:

I have noted the article describing the reclamation of cement sacks on three Western roads, published in the *Railway Maintenance Engineer* for March, page 85. In this connection the practice of the cement manufacturers in the handling of sacks may be of interest.

The original charge for cloth sacks is refunded in full to the original purchaser of the cement for such of the sacks as are still in serviceable condition when received by the manufacturer or that can be put in shape for further service with a reasonable amount of mending. The mending is done at the expense of the manufacturer. As a consequence, it is preferred that cement users make no effort to repair torn sacks. At the present time this is done only in isolated cases. In those instances where parties have endeavored to repair sacks it was found that the work was not done in a satisfactory manner. In many instances the method employed had resulted in decreasing the size of the sack to such extent that it would no longer hold 94 lb. of cement.

With reference to the question of limiting conditions governing the acceptance of torn sacks, each manufacturer, of course, has an opinion as to what expenditure he feels he can consistently make in connection with the repair of sacks returned in torn condition. For that reason no definite rules on this point can be made applicable to the industry as a whole. As far as this company is concerned, and I am sure all other cement manufacturers concur in this, we desire that no effort whatever be made to repair our sacks. Our customers generally understand our desires in this connection and return all sacks, leaving the question of repairs entirely up to us.

E. V. ALDRIDGE,
Manager, Sack Bureau, Universal Portland Cement Co.

THE SUPERINTENDENT OF MAINTENANCE

El Reno, Okla.

TO THE EDITOR:

The issue as to the standardization of track materials presented by C. A. Morse, in his address before the New York Railroad Club (abstracted in the March issue of the *Railway Maintenance Engineer*), is one with which the maintaenance department of every railroad has been confronted. There are very few railroads in the country that do not have to carry or order various track and maintenance supplies, far in excess of what would be required to maintain and keep in operation these utilities. This can all be attributed to the fact that there are entirely too many standards or rather to the lack of proper standardization. For instance, I can call to mind one railroad which carries about eight different kinds of water tank spouts on one division, owing to the purchase of different styles of tanks and cranes. If a proper standard were adopted and followed, the supply of spouts could possibly be cut to about two. The same principle applies to all track material, especially frogs, although the tendency in the past few years has led to certain standards being followed and this feature is being rapidly eliminated. As to rails and angle bars, I can only refer you to the rail sections and angle bars of any railroad in the country, where you will find almost anything in these two articles you may desire.

This lack of standardization is very costly not only to the particular railroad employing the system, but also to the manufacturers who have to supply the commodity when ordered and have to be prepared to furnish one style of article for one railroad with a slight change for another. Such manufacturers who have to await orders for these old standards are handicapped in that they dare not manufacture any more than needed, disrupting labor conditions to a certain extent and curtailing production.

It is very true that the maintenance matters are generally "handled by men who never had any experience until they were appointed division superintendents and who have had to get their experience after such appointment, while busily employed with the various other duties of the position." Maintenance has been considered as a secondary matter, but the time is fast approaching when the proper maintenance of a railroad will be given the attention it is so justly entitled to. Materials have increased in cost, reclamation projects are being recommended and committees appointed to investigate and the matter of prime importance now is to make well of what we have.

A division superintendent has always been conceded to be a master in the science of transportation and has been given ample facilities and assistants to assist him in his particular line, such as trainmasters, car distributors, operators, agents and transportation office force. To the department which is charged with the responsibility of keeping the railroad in shape to handle the traffic there is given may be a division or assistant engineer with party, a master carpenter and two roadmasters and the necessary section foreman and men.

It is a source of pleasure to note that the division engineers on some of our roads have been placed in the same category with the trainmasters, receiving the same salary. A roadmaster's territory is generally so long that he cannot give the proper attention to detail work which he should. I know of one roadmaster who has 33 sections under his jurisdiction. One can see how his time would be spent if he tried to devote a day to each gang during a month's time. He covers too much territory and at present, with labor and materials as they are, he should be able to personally supervise all gangs, with a view to the conservation of all time and material possible. It is usually put up to him to get a certain piece of work done and he does the best he can.

So far, maintenance matters have been handled in a fairly satisfactory manner by those entrusted with them, but it is wrong to place a man at the head of a department who does not have any idea of the proper manner of handling maintenance work. It is like placing a blind horse in the lead. Supervision by men trained in that branch of the work will eventually result and as there appears to be a link missing in the present divisional organization, I think that the appearance of the superintendent of maintenance will evolve from the conditions now existing and he will have entire charge of all maintenance and construction matters, leaving the superintendent of transportation to handle his own department, without trying to dictate maintenance policies which in half the cases are wrong, owing to his lack of perception of what should or should not be done in any particular instance.

ROY LEAS,
Assistant Engineer, C. R. I. & P., El Reno, Okla.

NEW BOOKS

Hydraulic Experiments. By Arthur M. Talbot, Fred B. Seely, Virgil R. Fleming and Melvin L. Enger, Bulletin 105, Engineering Experiment Station. Published by the University of Illinois, Urbana. Price 35 cents.

The experiments reported in this bulletin cover the loss of hydraulic head in small valves, the flow of water through submerged orifices; fire streams from small hose and nozzles; and the orifice bucket for measuring water. Part 1, covering small valves, is of particular interest because of the interesting facts brought out concerning the relative efficiency of globe valves, angle valves and gate valves. The informqation on fire hose and nozzles, aside from its value in design, is of considerable application in fire protection studies.

Proceedings of the American Railway Bridge and Building Association. Edited by C. A. Lichty, secretary. 228 pages, illustrated, 6 in. by 9 in. Bound in paper and cloth. Published by the Association, C. A. Lichty, secretary, 143 Waller Ave., Austin Station, Chicago. Price $1.

This volume contains the Proceedings of the twenty-eighth annual convention of the American Railway Bridge and Building Association, which was held in Chicago on October 15-17, 1918. The reports presented at this meeting were unusually practical in character and reflected the strenuous times through which maintenance of way men were passing last year. Among the reports of special value are those on the Repairing and Strengthening of Old Masonry; Sources of Railway Water Supply; Wooden Tanks, and Bridge, Decks and Guards. Several papers were also presented which were of unusual value, including one on Essential Work, by C. A. Morse, assistant director of the Division of Operation of the United States Railroad Administration, and one on Carrying Bridges Over, by C. F. Loweth, chief engineer of the Chicago, Milwaukee & St. Paul.

WHAT IS ESSENTIAL MAINTENANCE WORK?

DURING THE PAST YEAR the word essential has acquired a new significance. In the three years prior to our entrance into the world war, labor and materials had become increasingly scarce, but they were available to those willing to pay the price. With the inauguration of our own hostilities, it became necessary for this country to husband its resources. Millions of men were withdrawn from the already inadequate supply of labor and they had to be fed and equipped. The needs of the military were foremost and they had to be met even if others went without. It was soon evident that there were neither men or materials in sufficient quantities to supply the civilian demands. If left unrestrained this would have led to entirely disproportionate prices.

To promote the national welfare, the Government at this juncture, classified the industries as between those essential and non-essential, and priorities in labor and materials were granted in proportion to the extent to which these industries contributed to the basic needs of the country. The railways were placed high in the list of essential industries and thus were assured their necessary requirements, second only to the direct military demands of the government. The fact that they were in this favored position did not, however, relieve them of responsibility for the conservation of men and supplies, for in an organization as complete and with as many varied activities as a railway, certain portions of its work are more important than others. As our participation in the war increased and the stringency at home became more acute the necessity for separating the essential from the non-essential or from that which could be postponed temporarily became more apparent and when the armistice was signed on November 11, our country and our railways were practically on a 100 per cent war basis.

With the conclusion of hostilities there arose the natural feeling that such concentration on the most essential work on the railways was no longer necessary. But this is not the case. A system which had taken months to build up cannot be broken down in a day, and although the shortage of labor has vanished the efficiency of labor is far below normal while wages will probably remain high for some time. High labor costs will also tend to keep material prices high. The cost of work is therefore certain to be considerably above the pre-war basis.

Another condition confronting railway maintenance officers at the present time is the large amount of deferred work which necessarily accumulated owing to the concentration on the essential problems. This work is not eliminated but only postponed and must be done in the near future. Any season's program must not fail to consider this phase of the problem. The situation has been further complicated by the failure of the Revolving Fund, but even if unlimited funds were available at once it would be physically impossible to do all the work which should be done this year. It is therefore still necessary to select that work most important for first attention in preparing the program for this year. This problem not only confronts the chief engineer and general manager, but it is just as vital that the supervisor and the foreman study their work from this standpoint. It is with the desire to co-operate in the correct solution of this problem that we present several discussions on the determination of essential work.

PROBLEM ONE OF CLOSER SUPERVISION

By F. J. Meyer,

Roadmaster, New York, Ontario & Western, Walton, N. Y.

Regardless of the conditions under which transportation is conducted, essential work in the maintenance of way department of a railroad does not vary to any great extent. The refinement of maintenance varies considerably. A few months ago every railroad in the country and the maintenance officers in particular were anticipating further reduction in their badly needed supply of men and material.

The changing world conditions does not lessen the need of properly maintained track, but rather increases the need. The public little realizes that a track structure is not the work of a magician. Patriotic forbearance during the war emergency is quickly replaced by a demand for the old pre-war comforts of travel. Even now, before peace has been made, the clamoring has started. So maintenance men have a big problem on hand. Big, because for several years the track has suffered from lack of men and material. The reduction in tie and rail renewals during the past few years has merely postponed the need of replacement.

Considering the subject of essential track work, there are certain fundamentals of maintenance which must be held in mind. First, that maintenance is the prolongation of the life of existing track structure. Second, that maintenance must be continuous, sufficient, constructive and

progressive. Third, that while divided into two classes, the heavy work of floating gangs and the lighter work of section gangs, it is a single operation where the whole track structure is considered.

Maintenance pre-supposes a quality which assures safety and reasonable comfort. The refinement of maintenance is governed by traffic and speed. The track barometer is line, gage and surface and any operation is important to the extent that it affects one or all of these. No single maintenance operation can be neglected without affecting the entire track structure sooner or later. Therefore the heavy maintenance work, such as the renewal of rails, ballasting, surfacing and ditching is not only just as essential as the lighter work of the section gangs, but, if neglected, will, on a road of fairly heavy traffic, cause the track to deteriorate so an ordinary section force cannot maintain it properly.

It is apparent from even a casual glance at the track situation that every effort should be made to push the ballast, rail, surfacing and ditching operations to the limit from now until the tracks are back in the condition of a few years ago. The amount of material and the number of men available, rather than money costs, should limit the operations, for in spite of the present inflated prices the cost of bringing back track which has been neglected will more than neutralize the difference in dollars spent in 1919 rather than in 1920.

However, a proper balance must be maintained between the amount of heavy work done and that left for the section forces so that one does not suffer at the expense of the other. Conditions vary greatly on different lines, but, generally speaking, the work is similar and the time of its performance is governed by the seasons.

The first effort should be to secure as promptly as possible the required standards of line, gage and surface, for while perfect gage is not absolutely essential, *uniform* gage is, or good line cannot be secured. Wide gage is not economical. Line and gage are dependent on surface, that is the correct relative elevation of the rails must be maintained. The time permissible for this work and the refinement are matters which must be determined by local requirements.

The next problem is to renew enough ties properly to support the track and hold the gage, ever remembering that track is continuous from terminal to terminal and if too much time is used at one point sufficient time may not be left to perform all the work necessary on the rest of the track. After the tie renewals have been completed the line and surface should be gone over again, special care being given to joints.

The Eastern Regional Director issued orders last fall requiring the renewal of joints to face when practicable instead of relaying rail. That seems especially practicable this year where joints have been neglected owing to labor shortages the past few years. In connection with the renewal of all joints where new angle bars replace bent ones the joint ties should be tamped promptly or the trains will bend the new bars quicker than they can be applied. While renewing joints oil should be freely used on the bolts. This is merely a matter of economy.

The renewal of bars to face does not reduce rail requirements to any material extent and enough rail should be relaid to avoid even a possibility of abnormal renewals at some future time. Moreover the weight of relayer rail should be heavy enough to contemplate the probable traffic during the life of the rail.

Switch maintenance is very important. It might be said that the importance of a switch decreases as its distance from the main track or main lead. With the ever increasing wheel loads the use of longer leads is just as essential as heavier rail and should be so considered. Side track and yard maintenance vary liittle from main track work except that as a rule the standards are not as high.

Fence construction and maintenance should be vigorously pushed. So should the brush cutting and general cleaning. Much reclamation work is being done on many lines. There is no time like the present for starting it elsewhere. The material stocks are low and the proposition can be expanded as time goes on.

In the final analysis, essential work is a matter of closer supervision; the decentralizing and distribution of effort so that for a given requirement the track will be maintained accordingly and at a uniform standard; the quick shifting of plans if need be to meet local conditions and above all the realization of when all the time that can be spared has been given to any one particular maintenance operation, ever holding in mind the final outcome of a well defined plan which can be carried forward to meet future needs.

PAINTING OFFERS OPPORTUNITIES FOR CONSERVATION

By Harry S. Bird,
Master Painter, Philadelphia & Reading, Philadelphia, Pa.

The great shortage of available supplies of the past two years has compelled us to conserve wherever possible, not only in new materials and buildings in course of construction, but the old buildings, bridges and equipment must also render extra life and service. Therefore they should be well maintained and protected.

The buildings may be of concrete or brick but the wooden and metal trimmings are subject to exposure and decay if not protected. Steel bridges and equipment are subjected to the elements of corrosion and may become dangerous if corroded in a vital part.

Railroad equipment is more prone to corrosion because of the prevalence of strong gases from locomotives. Therefore it requires strict attention and protection. The best way of preserving metal and wood is painting. Such protection was never before more necessary than now, but the handicaps under which the foreman painter is laboring made it necessary that he resort to new ideas and methods. Some of the work may be in such condition that it can be postponed with safety.

Steel bridges which are not too badly corroded can be touched up with one or two coats on the rusted spots, instead of receiving a general painting, the vital parts receiving proper attention. Buildings may also be made to last for a temporary period by applying one coat of paint instead of two, only the most exposed parts receiving two coats, such as window sills and vertical surfaces where moisture and sunshine cause destruction.

Tin roofs should receive special attention. There is nothing so detrimental to a roof as the lack of paint. An old roof that is well pitted with corrosion spots can be treated with a heavy coat of tar or asphaltum paint which will seal the pores and prolong its life considerably. There are several good paints on the market for this purpose.

The repairing of skylights and glazing is part of the painters' duties, and is essential work, for a neglected skylight may become very dangerous. They should be inspected frequently and proper repairs made. The repair of windows will assist greatly in the conservation of fuel, for a broken window pane may be the cause of a frozen steam pipe or other damage. Electrical equipment painting is very important. Lamp posts and conduits should be well protected with insulating paint. The

lamp shades should be kept in a bright condition, with white enamel paint, thereby improving the lighting power and contributing to the saving of fuel.

Highway and crossing signs constitute another item of importance. They serve to protect the public and should be kept well painted at all times so that they may be easily read and thus serve their purpose.

The materials should be of the best quality, for never was more expected of a job of painting than now. Substitutes can be used for temporary work.

SAFETY AN ABSOLUTE ESSENTIAL

By Geo. W. Andrews,

Assistant to General Superintendent Maintenance of Way and Structures, Baltimore & Ohio, Baltimore, Md.

An absolute essential in bridge work is to maintain the structures in good physical condition, that they may be safe at all times for traffic. The primary elements in this are proper inspection; line and surface, and good ties properly placed. All members must be kept properly adjusted and but few loose rivets be permitted. On lines where bridges are numerous, this work alone will require a large force. All bridge seats and steel work should be kept free from cinders, ashes or dirt of any character. While painting is necessary, it is not an essential at this time, unless the structure has been permitted to become very rusty, but can, in many cases, be postponed until much other work has been done.

It is necessary that all timber structures be kept in proper line and surface and proper physical condition for carrying the traffic. Timber structures, as well as steel, require close inspection, and this should not be neglected. To maintain good physical conditions, it is of course, necessary to commence at the ground line and work up to and including ties, or practically the entire structure, and it is, therefore, necessary that all timbers be kept in good physical condition. While it is true that a certain amount of decay does not radically affect the strength of the structure, it does create a fire risk, which, if allowed to continue usually results in partial or total destruction of the bridge.

I believe that, under existing conditions, we are prone to assume greater risks and take chances that are not justified, and that with the heavy power and equipment that we are now operating over many of our structures, bridge maintenance requires closer attention than at any time in the past.

Masonry structures as a rule require comparatively little work, but it is necessary to maintain close inspection to avoid the undermining of foundations. All culverts must be kept free to avoid the washing out of fills.

With buildings, first attention should be given to the proper maintenance of terminal roundhouses and shops. See that they are in good condition for the winter and all heating and water lines properly overhauled, all drainage kept free and open, and the building maintained in good sanitary condition. Station buildings should be next considered and such work done as may be required to keep them in safe, clean and sanitary condition. The painting of buildings of this character, as well as all other buildings, should be postponed until the more urgent work has been completed, except where conditions have been permitted to reach a point where it becomes necessary to paint to prevent deterioration and maintain sanitary conditions.

Water is one of the essential supplies which it is necessary to maintain at a high standard at all times. The work to be done here can be covered in a few words; furnish the best quality of water obtainable in the vicinity of the stations and maintain all of the equipment and appliances in connection with the water station in good physical condition.

In conclusion, it should be remembered that on all maintenance of way work, the essential thing to consider is maintaining safety for traffic as far as may be permitted by the forces and materials obtainable.

THE ESSENTIAL IN BRIDGE WORK

By Geo. W. Rear,

General Bridge Inspector, Southern Pacific, San Francisco, Cal.

For several years it has been necessary for those in charge of the maintenance of bridges and buildings to eliminate all but the most essential work—to "hit the high spots" as it is generally termed. This was at first due to the necessity of restricting expenditures and later to the growing scarcity of men and materials.

More recently when we were at war and our first object was to place every resource behind the fighting men, the necessity of restricting the work even further was apparent. Now that the railways must curtail some work because of a temporary shortage of funds just what may or may not be essential is open to differences of opinion, with good reason perhaps, because what is essential on one road may not be on another and what was essential yesterday may not be today.

From a bridge and building standpoint the really essential things support the track, although several other things such as fuel and water stations are closely allied. Still a railroad may be operated without the use of any particular fuel or water station, but every inch of the track must be supported if we are to operate even one train with safety. The excellent condition of adjacent structures will not help a poor one, so from the standpoint of safety no work necessary to support the track can be omitted.

Where structures are conservatively designed and properly constructed, wear and decay are the principal forces to contend with and with most structures decay may be considered the chief destroying agency. Any structure supporting trains must be of sufficient strength to carry its loads without any suspicion of hazard and if decay is the deciding factor, it will certainly not decay enough in any one year to become unsafe. From this it would appear that in an emergency all work could be suspended for a year and should necessity arise no doubt this could be done, excepting the tightening of bolts and the little odds and ends such as lining and surfacing. This would be true if all structures were in first class condition to begin with. However, nothing accumulates quite so fast as deferred maintenance, as has been demonstrated on the railroads of Europe and on certain lines in this country.

Where a railroad is blessed with structures of a permanent character (if there are such things) maintenance can be neglected to a certain extent, but where structures number 30,000 to 40,000 and are principally of wood with a life of 15 to 20 years, it will be seen that two or three years' deferred maintenance will cause considerable anxiety on the part of those responsible for them. Wooden structures, generally classed as trestles, are usually renewed according to a regular program, as they cannot be permitted to get into such a condition that renewal is a matter of days. It is also the usual experience to find, on tearing a structure out, that it is in poorer condition than any possible examination while still in service would indicate.

Even though the war is over these are still unusual

times and unusual methods must be adopted. This fact is forced on us whether we are willing or not. Some trestles will have to be renewed, these being largely the carry-overs from the last two or three years' program, but those naturally falling into this year's program can be postponed a year with little expense if necessary.

Frequently the splicing of a few piles and the addition of a few helper stringers will be all that is necessary. Piles generally decay at the ground and where one or two in a bent become too weak to be safe, they may be spliced by cutting them off below the ground. Where stringers show decay enough to make renewal advisable an extra one of second-hand material placed alongside the others will give an increased factor of safety and add another year or two of life to the structure. Trestle ties should be renewed in plenty of time, but it is poor policy to put new ties on stringers that will not last more than a year or two. This is not the case where ties are dressed to size and not dapped over the stringers. Usually, however, repairs can be made by inserting second-hand ties and an extra year or two of life secured.

Wooden culverts are usually permitted to show signs of collapse before renewal and, of course, when they reach that stage renewal cannot be postponed. Where the depth of embankment makes the labor of renewal expensive, some more permanent material than untreated wood should be used. However, where cedar or redwood can be obtained good boxes can be made and a reasonably long life can be expected.

Generally concrete and masonry structures require little repair and except in rare cases repairs can be postponed for a year at least. Steel structures are classed as permanent but are only so to the extent that they are taken care of. If neglected they have probably as short a life as wood. Certain county and city bridges have been found to be in a dangerous condition after 18 to 20 years, due to lack of paint.

Painting is necessary, but in these times spot-painting should be resorted to. It is a question if this is not the best method at any time. Steel bridges rust in spots and if these are scraped and painted once a year, the general condition of the bridge will be better at less cost than when the bridge is allowed to go several years and then given a full coat. Where paints of the same color are used the spot painting is not noticeable and does not present an objectionable appearance.

Where steel bridges are overstressed but in good condition, they can usually be carried over on the principle that if they answer the purpose today they will do tomorrow. While it is good policy to increase the capacity of a line by permitting heavier loads to pass over the bridges if to do so will require much steel it will probably be better to postpone the work at the present time.

Wooden trusses cannot be temporized with when they become an endless source of trouble and little can be done to strengthen them. Where stream conditions permit, they may be shortened by placing piers under some of the panel points and a year or two more life obtained. Piers placed under the panel points should be strong enough to carry the reactions at those points so as effectively to shorten the span. Instances have been noticed of single bents of four piles under the end panel points of Howe trusses being expected to carry the entire reaction of 140-foot spans.

Wooden lined tunnels require constant repair and this is one class of work that should be carried on, no matter what the cost. While decay causes a great deal of trouble, perhaps the most work is required to offset the tendency to crowd in. Most tunnels either crowd in from the sides or up from the bottom and, if neglected, soon become dangerous. Special types of structures such as snow sheds, snow fences, etc., should be kept in such a state of repair as will permit them to answer.

Buildings are of two kinds—one useful and the other more or less ornamental. The useful buildings are those actually necessary to permit the railroads to operate, such as engine houses, shops, water and fuel stations, freight sheds and the majority of passenger stations. The ornamental buildings are those erected usually to satisfy civic pride or which anticipate actual requirements by many years.

Efforts should be made to construct all necessary buildings and to keep existing buildings in a fairly decent state of repair, but buildings not actually necessary should be allowed to wait a more favorable time.

All should be kept sufficiently well painted to preserve them and to give them the appearance of having an owner, but where the paint is good but faded and dirty, they should not be repainted just to make them look bright. Usually an endless number of minor changes are being made in railroad buildings to suit the occupants, but most of these should be cut out at this time and only such work done as will give immediate results. Many buildings which are no longer used for useful purposes can be moved or torn down and the material used elsewhere.

The existing conditions are only temporary and in a few months or a year sufficient extra work can be done to bring the properties up to their usual good condition.

The best gage to determine whether work is essential or not is to consider whether you would spend the money if it were your own and all inspections and recommendations should be made in that spirit.

NEW YORK CENTRAL TRACK INSPECTION

THE RESULTS of the 1918 track inspection of the New York Central show the Eastern division, F. S. Hunt, division engineer, to have secured the highest ratting for the four divisions on the main line between New York and Buffalo. This division was rated at 83 per cent, with the electric division, F. Boardman, division engineer, in second place with a rating of 82.6 per cent. Subdivision No. 3 of the Eastern division, M. E. Egan, supervisor, received the highest rating for a supervisor's subdivision, 83.6 per cent, with subdivision No. 7 of the Mohawk division, F. L. Vault, supervisor, in second place with a rating of 83.1 per cent. Subdivision No. 23 of the Syracuse division, A. M. Clough, supervisor, received the highest rating, 83 per cent, for a supervisor section on this division, and subdivision B of the electric division, C. J. Redifer, supervisor, with a rating of 82.6 per cent, is in first place on that division. Section No. 8, subdivision A, of the electric division, Pietro Matzell, foreman, received a rating of 85.8 per cent, the highest rating for a foreman's section.

The object of the premium system is to reward foremen for their individual efforts during the year rather than for the appearance of their sections on the day of inspection. For this reason certain sections receiving high marks are excluded from the premium list. On the main line sections the foremen having the best track on their respective subdivisions receive a premium of $3 per month. The foreman having the best section on each of the ten main line divisions (except on the electric division) receives an additional premium of $2 per month, making a total of $5 per month. On the nine branch line sections the successful foremen receive a premium of $2 per month, while on yard sections the premium to the successful foremen is $3 per month.

Sewing Patches on Torn Sacks

THE PROPER HANDLING OF EMPTY CEMENT SACKS*

Practices of the User and Manufacturer Which Affect the Salvage of These Containers

BY E. V. ALDRIDGE,
Manager Sack Bureau, Universal Portland Cement Co., Chicago

CEMENT IS SUPPLIED to the user in two kinds of packages, the non-returnable paper bag and the returnable cloth sack. A paper bag is capable of making but one trip between manufacturer and user and like containers of most kinds is of no value after being emptied. A cloth sack, on the other hand, will, through proper handling, make many trips during its life. Therefore, the relative cost of the two packages to the cement user is not proportionate to the first cost of a cloth sack as compared with that of a paper bag. In fact, if cloth sacks are not misused or allowed to become wet and are returned to the manufacturer as soon as empty, they are more economical from the user's standpoint than paper bags.

The first cost to the buyer of cement is, of course, less in the case of paper bags. Furthermore, there is not the trouble and expense connected with the handling of cement in paper bags, which to a greater or less extent must follow the use of cloth sacks. However, the paper bag is naturally weaker than the cloth sack. Consequently, when filled with cement, a comparatively heavy commodity, it will not so well withstand the strain to which it is subjected in transit, nor the handling it must receive in the hands of the user. The preference as between the returnable and non-returnable package on the part of the user is evidenced by the fact that about 90 per cent of the cement shipped to-day is packed in cloth sacks.

CAUSES FOR LOSS

Experience shows clearly that cement users' most serious sack losses result from sacks being damaged by water, destroyed or diverted to other uses while in their possession and as a consequence never returned to the manufacturer. The percentage of returned sacks rejected as unsuitable for further use as cement containers is exceedingly small. Returned sacks are rejected for two principal reasons: Either the sacks have been damaged by water or they have been torn and mutilated beyond the possibility of repair. The percentage rejected on account of their having been worn out in service is negligible.

Included in the price of cement is a charge for the cloth sacks in which the cement is packed. This investment in packages draws no interest and refund for those sacks returned in good condition is not made until the sacks are again in the hands of the manufacturer. Therefore, it is to the advantage of the user to see that the empty sacks are returned to the manufacturer promptly. Water is the chief destroyer of cement sacks. Through its action the fiber of the cloth is rotted and as a consequence the sack is rendered unfit for further service. If empty sacks are stored where the weather protection is poor a rain over night or even long storage in a damp atmosphere can easily result in a loss running into hundreds of dollars. A sack used here and there as a tool bag, as a container for sand or other materials, or as a covering for wet concrete, may seem of no consequence, but the resultant loss may soon reach surprising proportions. Consequently, it is an easy matter for a cement user through lack of attention to the empty sack question to lose not only the interest on the unproductive capital he has tied up in sacks on account of not returning them promptly, but also to lose a considerable percentage of his original investment.

The question of unjust rejection of returned sacks is a natural outgrowth of the use of a returnable package for transporting such a material as cement. The user must pay the package cost, whether it be a returnable or non-returnable package. The manufacturer endeavors to do all possible to keep the package cost to the user at a minimum, but, as has been pointed out, it is within the province of the user himself to accomplish the greatest results. Just one thought in this connection: A cloth sack makes an average of eight trips during its life. If through proper handling the number of strips is increased to but nine the user's package cost is reduced one-ninth.

The fact that proper care and prompt return of empty sacks means a direct saving to the cement user is self-evident. Despite the fact that the manufacturers have for years endeavored to show cement users that cloth sacks are valuable property, the misuse of sacks continues to such extent that the sack losses of those concerned are far above what it is possible to make them. The manufacturers' interests in this proposition are not confined to the continued and widespread preaching of the doctrines of the proper handling and prompt return of empty sacks. They also exert no small amount of effort to make possible prompt credits for sacks returned.

After considerable study and thought on the part of both the carriers and cement manufacturers certain requirements relative to the shipping of returned empty cloth sacks were included in the classifications. These rules are as follows:

1. Sacks when shipped in bundles must be securely bound with not less than three separate wire or rope ties, the rope to be not less than 3/16 in. in diameter.
2. Each bundle must be tagged with a linen tag securely attached by wire, showing names and addresses of both consignor and consignee.
3. Freight charges must be fully prepaid.

Concerted and continued effort on the part of individual manufacturers as well as the Portland Cement Association has been exerted to secure complete compliance with these rules on the part of shippers. The Portland Cement Association several years ago prepared and circulated a placard showing the proper methods of bundling and shipping sacks. These methods include not only those required by railroad rules, but in addition certain suggestions which experience has proved advan-

*Presented before the annual convention of the Railway Storekeepers' Association at Chicago on January 27-29.

tageous. In this connection this placard is in the process of revision and in the near future copies can be obtained free of charge in such quantity as desired.

As a means of securing compliance with the linen tag requirement manufacturers make it a general practice to supply all shippers with such tags free of charge. These tags bear the printed name and address of the manufacturer to whom the sacks are to be returned. Consequently, it is only necessary for the shipper to fill in his own name and address. Those tags supplied by the Universal Portland Cement Company call for certain additional information, which if given is certain to insure more prompt credit. This consists in showing the name and address of the party for whose account the sacks have been returned, as in some cases the purchase of the cement has been handled through a dealer. Space is also provided to show the date of shipment as well as the number of bundles and the number of sacks contained in the consignment. This advice is especially desirable in case a shipper returns two or more lots of sacks within a comparatively short time and these become consolidated en route. In some cases a portion of one or more of such shipments may be delayed in transit, making it difficult for the manufacturer to determine which shipment was delivered short in the first place.

Of course, all shippers do not comply in detail with all the various requirements. Consequently, many shipments are received which have been bundled and tagged in violation of the classification requirements. Such cases mean two things: On the one hand the party shipping the sacks failed to do his part, and on the other hand the railroad agent at the point from which the sacks were shipped accepted the shipment in violation of instructions.

It is the practice of the Universal Company to notify the freight claim departments of those railroads concerned each month of any violations which have come to notice. It is known that this information is appreciated by the claim departments and the advice transmitted to the local agents concerned. This whole proposition of properly bundling and shipping sacks benefits not only shippers of returned empty sacks, but is of decided benefit to the carriers in that it reduces the possibility of subsequent loss and damage claims.

In their methods of handling cloth cement sacks, from the time they are received on the job until they are returned to the manufacturer, the railroads as cement users are not exceptions to the general rule. It is a fact that they misuse sacks, that they allow sacks to become wet, and that sacks receive rough handling while in their possession. It is also a fact that returns from railroad jobs are, as a whole, slower than from any other class of cement users. Further, a comparison between the number of sacks returned and the number furnished shows a marked deficit, indicating that many sacks are destroyed and used for purposes other than cement containers. A study of the records shows that the railroads themselves are also included in the list of those shippers who violate the classification rules. Certain shipments are received which are improperly tied or tagged, in many cases paper tags being used rather than linen tags. These statements are not made as a direct criticism of the improper handling of sacks by the railroads from their own work, but rather with the thought and hope that possibly a knowledge of actual conditions will result in a reduction in sack losses by the railroads, the securing of better credits for empty sacks returned and accordingly increased sack efficiency.

Perhaps an outline of the sack handling methods of the Universal Company, which is called upon to handle millions of returned empty sacks annually, will be of interest and serve to show some of the detail involved in the proposition from the manufacturer's standpoint.

One of the requests made to shippers is that original bill of lading, accompanied by invoice covering the number and value of the sacks contained in the shipment, be forwarded promptly upon the delivery of sacks to the railroad. Receipt of notice of shipment is acknowledged by post card and the bill of lading and invoice is then turned over to the sack department at the plant. Miscellaneous L. C. L. shipments concentrated at transfer points are delivered in carload lots. The individual shipments are sorted out according to the information shown on the tags and the number of bundles received is checked against the number claimed on the bill of lading. If no notice of shipment has been furnished and the tags do not show information as to the number of bundles in the shipment it can be appreciated that it must subsequently be developed whether a shipment has been received complete. The destination expense bill is of assistance in this connection, but this is not always available at the time sacks are delivered. Often the tags show only the contractor or foreman on a particular job as the shipper. In such cases investigation is necessary to determine the identity of the original purchaser of the cement.

The next step in the operation is the cleaning of the sacks by vacuum cleaners. A count of the contents of each individual bundle is made as the sacks are cleaned. At this point record is also taken as to the method in which the bundles are tied and tagged, and from this record any violations of the classification rules are reported to the carriers in the manner previously referred to.

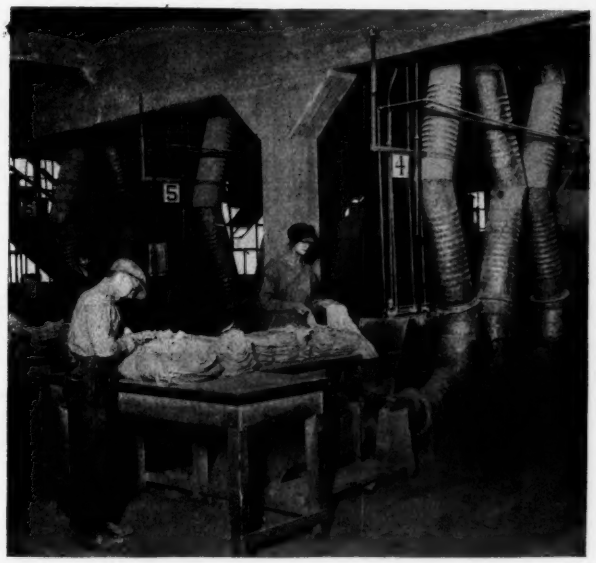
Leaving the cleaners, the sacks go to the sorters, where they are classified as good, repairable, useless and foreign. The number of each kind so classified is determined by the inspection tally, which must check with the bundle count. As full credit is allowed for repairable as well as for good sacks, no further inspection of these two classes is made. The useless sacks, however, are inspected again to see that no sacks are rejected which are suitable for further service or which can be put in serviceable condition with a reasonable amount of mending. This work is done without expense to the user. The good sacks pass on to the tying room; the repairable sacks to the mending room, then to the tying room. As Bates valve machines are used in the packing rooms, the sacks, which have a small valve opening in one corner, are tied before being filled. In packing the sacks are placed on the spouts of the machines in an inverted position and the cement is forced through the valve and into the sacks under pressure. The flow of cement is cut off automatically when the proper weight has been introduced. This method accomplishes accuracy in weight as well as speed in packing and loading.

The tied sacks are transferred to the packing rooms or put in storage. The good used sacks, the repaired sacks and new sacks are equally distributed to insure a uniform quality in all outbound cement shipments. The inspection reports are approved and the sack checks made out and forwarded to the proper parties. A stub is attached to the check, on which is shown the identity of the particular shipment the check covers, whether the shipment has been received in full, as well as detailed advice relative to any useless or foreign sacks contained in the shipment. In case the percentage of rejections is abnormally large a special letter is written the shipper advising in detail as to the condition of the rejected sacks. It is felt that with such information it may be possible for those concerned to prevent further similar losses.

One can get an idea of the detail involved in case of a manufacturer with a fairly large output when it is con-

sidered that the sack handling department at the Buffington plant of the Universal Company is designed to take care of 150,000 returned empty sacks per day. Regardless of the volume of work handled it is the aim to maintain the sack end of the business with all possible efficiency, to secure proper handling of sacks and to assist in every way to insure prompt credits for returned sacks so that the package cost to the cement user is reduced to a minimum.

While on the subject there is one method of handling cement that deserves a few words: That is, the use of cement in bulk. This method has many advantages and makes possible a decided saving in cement costs in cases



Feeding Sacks into the Vacuum Cleaners

where local conditions permit its use. This can be affirmed in the case of several railroads which, during the past few years, have used bulk cement in construction work in fairly large amount. Among the reasons why cement in bulk will net a saving as compared with its use in packages are the following:

1. Net price of cement in bulk is less than in either cloth sacks or paper bags.
2. Sack losses are eliminated.
3. Less labor is required to handle cement from car to mixer.
4. No labor is required to count and bundle the empty sacks for return to manufacturer.
5. No bookkeeping on sacks is necessary.
6. No storage space need be provided for sacks.
7. No fire insurance on sacks need be carried.
8. No hauling expense and freight charges in connection with return of empty sacks.
9. No loss on account of cement being left in sacks because of carelessness in emptying.
10. No money is tied up in sacks. Such money draws no interest and is not refunded until the empty sacks have been received, counted and inspected by the manufacturer.
11. No money is spent for paper bags, which account of being capable of but one trip are a dead loss when empty.

The usual objections made to the use of bulk cement are:

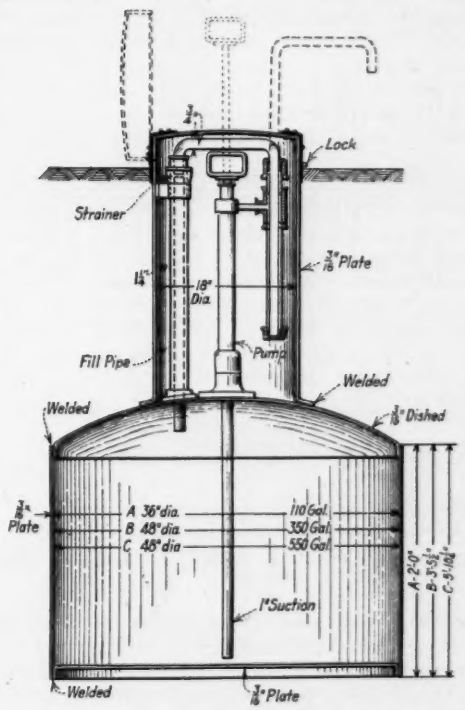
1. Possible damage by water to the cement in transit or in storage.
2. Dust.
3. Difficulty in unloading, measuring and handling.

Cars used for bulk shipments are carefully coopered before loading to insure against possible leakage or damage in transit. If water does penetrate a leaky roof the damage is localized in case of bulk shipments, while if cement is packed in cloth sacks or paper bags damage will extend over large area. Storage in packages will not prevent absorption of water from the atmosphere. A tight weatherproof storage is required for either bulk or sacked cement. Especially at the mixer, bulk cement can be handled with less dust than sacked cement. Even though bulk cement is unloaded with no equipment other than shovels and wheelbarrows, users have effected a saving in handling cost. Furthermore, the men prefer to handle it in bulk. Cement in bulk can be measured just as accurately as sand or pebbles, all of which materials in concrete making are measured by volume.

The possibilities of the use of bulk cement deserve serious consideration. In case of a job of any considerable size the saving possible through the use of bulk cement will many times exceed the cost of installation of equipment necessary to handle it.

STORING GASOLINE

SAFE AND CONVENIENT storage of gasoline is afforded in a new underground gasoline storage unit recently developed by the Wm. Graver Tank Works, Chicago. It is especially adapted to railroad use. As shown in the cut, it consists of a welded steel tank buried in the ground so that the top is covered to a depth of about 2½ ft., access being had by a steel plate shaft 18 in. in diameter welded to the top of the tank and extending about 6 in. above the ground surface. This shaft contains all the equipment for filling and drawing off gasoline and is pro-



Details of the Tank

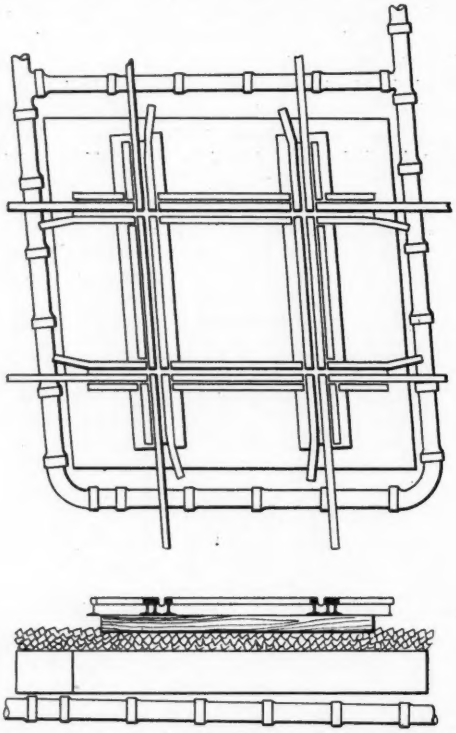
vided with a cover, so that the tank may be sealed against tampering.

The equipment consists of a 1¼-in. filling pipe, a pump and a ¾-in. discharge pipe. The latter is made to telescope into a 1½ in. pipe so that when it is to be used this discharge pipe may be drawn up out of the well and turned in a convenient position for filling a can or pail. This form of storage unit may be had in sizes varying from 110 to 1,000 gal. capacities.

A CONCRETE RAILROAD CROSSING FOUNDATION

POOR FOUNDATIONS constitute one of the principle causes of expensive maintenance, frequent renewals and poor riding qualities of railway crossings. One crossing manufacturer has said: "I cannot understand why some railroads will pay me their good money for high-priced crossing construction and then proceed to allow the crossings to be racked to pieces on a soft roadbed with little or no real ballast." It was with these facts in mind that the Chicago, Burlington & Quincy undertook to test the idea of placing railway crossings on concrete slabs, not as a substitute for ordinary track construction, but as a stable substructure on which the ballast, ties and rails of the standard construction could be supported.

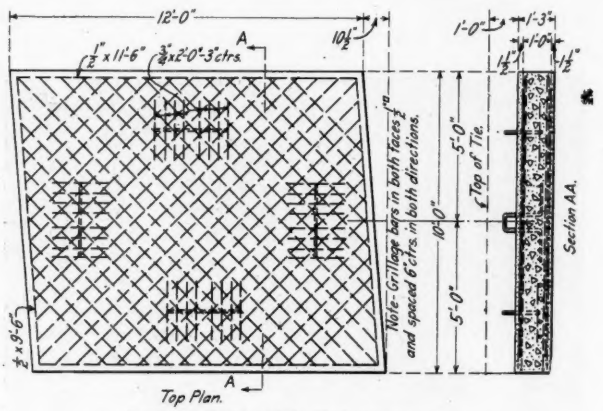
That this construction is permanent is evidenced by the service of one installation of this type at a crossing with the Illinois Central at Christopher, Ill., since 1914. Success with this first installation has led to the use of this form of construction at a number of other points. Just



Arrangement of the Track, Ballast, Slab and Drainage System

how much has been saved in reduced maintenance costs and increased life of the crossing is not known in terms of dollars and cents, but in each case where the installation has been made a notable improvement is indicated. Obviously the points selected for these test installations were those where the roadbed conditions were particularly unfavorable. Other installations of this kind are now in service under a crossing with the Cleveland, Cincinnati, Chicago & St. Louis at Litchfield, Ill., with the Union Pacific at Grand Island, Neb., one at Hastings, Neb., and a double crossing with the Union Pacific at Omaha.

The nature of the construction is illustrated in the drawing. The idea implies a combination of a rigid foundation with provision for adequate drainage. The concrete slab is surrounded by a line of four-inch sewer pipe placed with open joints at an elevation sufficiently below the slab to insure the drainage of the soil upon which the slab rests. This line of pipe is carried to some suitable outfall. The slabs are made 1 ft. 3 in. thick and have a width of 10 ft. for each of the intersecting tracks, except that at double-track crossings the slabs are made wide enough to join on the center line between tracks. Reinforcing is provided in sufficient amount so that the slab will be strong enough to distribute the train loading uniformly over the entire area. It is also designed to



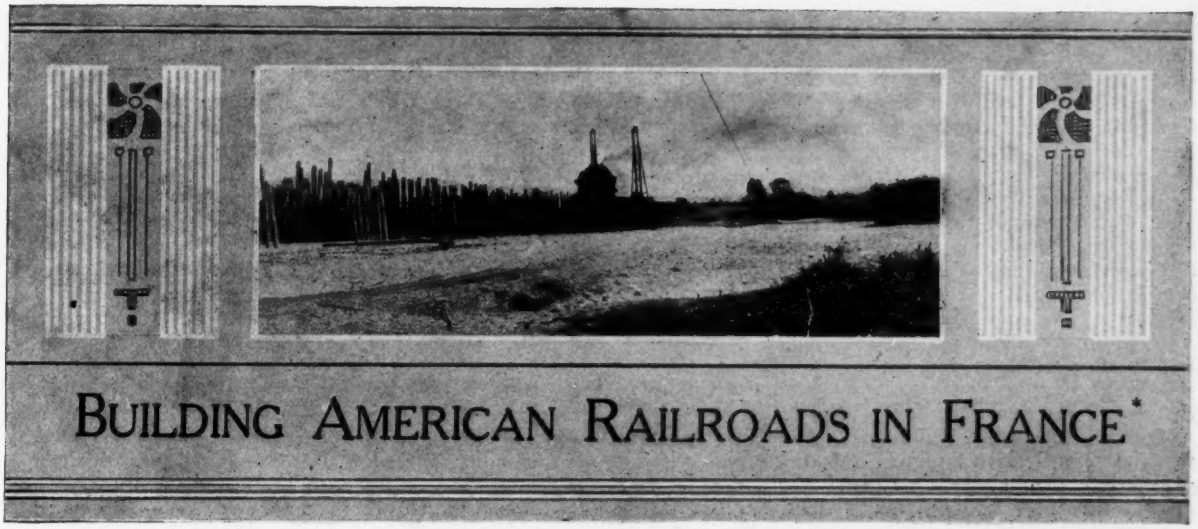
Details of the Slab Reinforcement

withstand the stresses consequent to being handled by means of the lifting stirrups.

The slabs are made of 1-3-6 concrete and a 10-ft. square slab for a single crossing contains 4½ cu. yd, of concrete and 800 lb. of steel and weighs 9½ tons. Obviously the slabs are built at some convenient point for concreting, preferably a slab yard, and are then shipped to the crossing and lifted into place. To do this with a minimum interference of traffic the excavation must be completed preparatory to the placing of the slab without taking the crossing out of service. Accordingly the ties are first cribbed out, the track then carried on jacks and the ballast and earth underneath the ties removed to a depth of about 2 ft. 3 in. below the base of rail, the track being supported in the meanwhile on stringers and blocking until ready to place the slab. The crossing is then disconnected and lifted out with the ties attached, the slab is set into place, covered with a 6-in. layer of ballast and the crossing replaced. In some cases a 6-in. layer of cinders has been placed underneath the slab with the idea that it facilitates drainage of the foundation area of the slab.

The cost of an installation of this kind depends upon a number of factors that are influenced greatly by the local conditions. For instance, the cost of the slab depends upon whether it is made in a regular slab yard or is built in forms near the site of the crossing. The length of haul to the site is also an important factor. The cost of setting the slab in place is influenced largely by the expense of getting a derrick car to the site and by the amount of work train service needed. The expense for trackmen in preparing the excavation and in resurfacing the crossing after the slab has been put in place is also subject to variation with the amount of interruption due to the passage of trains. As an illustration of this, the cost for track labor in an installation at a single crossing at one point was $27.30, while the cost of labor in installing a foundation under a double crossing where the train movements were frequent was $139.

We are indebted for the above information to B. M. Cheney, general inspector permanent way and structures, Chicago, Burlington & Quincy, Chicago.



BUILDING AMERICAN RAILROADS IN FRANCE*

An Outline of Some of the Problems Met by the Sixteenth Engineers, Railway, in Providing Transportation Facilities

BY MAJOR O. C. F. RANDOLPH,
Manager of Sales, Building Department, H. K. Ferguson Co., Cleveland, O.

THE SIXTEENTH ENGINEERS was recruited from railway engineering and operating men principally from Cincinnati, Cleveland, Toledo, Detroit and Grand Rapids immediately after war was declared. H. Burgess, U. S. district engineer at Detroit, was made colonel and G. H. Webb, chief engineer of the Michigan Central, lieutenant colonel. The regiment was mobilized at the Detroit Fair Grounds under a war department order of June 5, 1917. On July 27 it left for Is-sur-Tille, France, via Halifax and England. On arrival at its destination, the regiment was assigned immediately to the construction of needed facilities for an advance base at this point.

The distribution of material across the front for the northern sector in France was to be made from Gievre and for the southern sector from Is-sur-Tille. Gievre was at the same time to serve as a main storehouse. Each depot was to hold reserve supplies for a million men—Gievre for 6 months and Is-sur-Tille for one month. In addition, each one nesessarily maintained a mobile supply, so that they could constantly keep a million men operating in the field without disturbing the permanent reserve.

This was our problem: the building of docks of sufficient size to handle supplies; a terminal at the base to facilitate their handling; an intermediate base at Gievre and an advance base at Is-sur-Tille, and engine terminals and divisional yards to handle the increased traffic.

The general method of purchasing land was to stake out the section which we wished to occupy and get the mayor of the neighboring village (and there is always a neighboring village in France), to come out and go over the tract. The land in France is owned in small parcels of one-half and one-quarter acres and no one else than a mayor could untangle the ownership of the land we wished to buy. We would see the mayor, who would secure power of attorney for the land required and we would buy it through him. Leases were made in the same way. We were generally held up in much the same way as when purchasing land in the same way in this country.

All materials and tools had to be bought in the same manner that they would in this country. Of course, some of the supplies were secured from some of our own forces, but this involved as much trouble as buying it here. For a large job, the source had to be located, availability determined upon and the initiative for that necessity rested upon the man desiring the supplies. In this connection it is worthy of note that we never caught up with lumber, or rather, it never caught up with us, as up to the time I left we still had a man looking for lumber and were taking every stick that we could secure. At Is-sur-Tille the vast majority of the lumber was secured from Switzerland. The Swiss Government several times threatened to shut down on it, but never did. We even received numerous cars from German railroads, some of them having shipping tags on them which indicated they had come from Germany and at a recent date. Our agreement with the Swiss mills called for our furnishing cars and they returning them to us. Probably the Germans had the same arrangement, and they possibly secured some of our cars as we secured some of theirs. Lumber was also secured in large quantities from Scandinavia. Towards the latter part of the work at Is-sur-Tille we began to secure lumber from the American mills. These mills were operated by the 10th and 20th Engineers, who were foresters recruited from the lumber regions of this country. They brought their own equipment, and set up the mills in the French forests.

Although our men were experienced lumbermen and operated in the forests they could only cut, even under the stress of war conditions, such trees as were indicated by French forestry authorities. We could not cut a single tree, although we bought the land, or made proper arrangements with the owners, without receiving the consent of the Government forestry officials. When the lumber started coming, it came by the train load and contained nothing but 3 in. by 9 in. and 1 in. boards. The boards had not been edged, but were delivered just as they came from the gang saw.

Our labor was supplied by the 1,700 men in our regiment, 3,000 infantrymen and 2,000 other engineers.

*This article is abstracted from an address delivered before the Cleveland, Ohio, Engineering Society on March 25. Major Randolph joined the army in July, 1917, as second lieutenant with the Sixteenth Engineers, Railway, with which unit he was connected until discharged on December 15, 1918.

There were also 600 Spanish contract laborers present. There seems to be prevalent in the world an impression that soldier labor is ideal and provides a panacea for all of the difficulties ordinarily encountered with labor; that one can, by holding a club over a man's head in the form of a prospective guard house sentence, inspire maximum effort. If one will consider the difference between a man digging two yards of dirt a day and one digging six yards, he will readily see the absurdity of such an idea. The minimum probably can be driven from men—beyond that it is difficult to go. In the first place, it was not necessary to drive our men because of the very wonderful spirit that was always present. Everyone was anxious to do something if he could only be shown what to do. To get each one to put forth a little more than he thought necessary and to get his interest to the point of feeling the work was in a way a part of him was the means of securing maximum effort.

The schedule was the means of doing this and time was the reward given the men. A portion of work was given to a man and any time saved was his own. This really produced wonderful results. The man day output for 4,000,000 ft. b. m. of lumber was 350 ft. per man. That includes all overhead hanging of warehouse doors, excavation and other labor. When in Washington I looked over the costs for American camps, and using their rate of wages, they averaged about one-half that output on their carpentry. Their work was but little more difficult than ours and their figures included carpentry alone with no overhead.

In this connection the handling of tools is of considerable interest. All tools had to be provided by us. Imagine, if you can, working 300 carpenters and providing them all with their tools and having a constantly shifting gang to deal with and each man anxious to have a hatchet, saw and hammer for future use. The remedy lay, of course, in an accounting system that was simple and correct. The one adopted was to provide a board with a nail for each man's number, then to number all the tools. When a man drew a tool the number of that tool was hung on his nail on the board. A check of tools was then easy; it was also just as easy to check any one man, for all one had to do was to refer to his number on the board.

To facilitate the drawing of tools and to insure men having their same tools each day, we had a locker system which consisted of a series of bins, each about 8 in. high, 10 in. deep and 2 ft. 6 in. long. Each bin was numbered as the men were and a man wishing to hold his same tools over from one day to the next, handed them in at night to one of the errand boys, who put them in the proper box and handed them out when the number was called in the morning.

On one occasion we had a camouflage factory to build in Dijon. We were notified one Thursday to get ready to build it, the site was indicated, and we shipped the lumber from Is-sur-Tille at once. On Saturday we received word that we might go ahead with the work. The project was to include two buildings of the warehouse type, one 300 ft. and one 400 ft. long, also an open shed 40 ft. by 500 ft., with nothing except a roof. Our gangs were well organized at that time and the camouflage company was at full strength of 250 men.

The superintendent and I went to Dijon Sunday and laid out the buildings on the ground, also scheduled the work. Monday at 8 o'clock our men arrived from Is-sur-Tille and at 9 were working. The lumber had arrived on Saturday and we had started six trucks hauling it the two miles to the site, at 7 a. m. Monday. The project was finished on Thursday and on the same day we received a request from the Chief of Engineers to submit monthly progress reports on the work and to send him the date of completion.

We left Is-sur-Tille in March for the British front. There we built a narrow gage track and a standard gage rail head, the narrow gage connecting the rail head, an engineering dump, an ammunition dump with the front, with leads to light artillery positions. The ruling grade was 2 per cent and the sharpest curve was of 30-meter radius. I believe the speed limit was supposed to be 8 miles per hour, though they ran 15 and 20. In 20 miles of track, a cut of 4 ft. and a fill of 5 were the largest; a two-foot cut was heavy and most of the grading consisted of 6-in. cuts or fills. The cuts were 9 ft. wide and the fills 10. We used corrugated iron in half segments for culverts. Everything except the large cut and fill mentioned was waste and borrow.

As this work progressed we were short of labor for the excavation. The British had a number of Chinese companies scattered around the country, there being a camp of them not far from us. We convinced the British commanding officer that we could stake out the dirt work and give them piece work. We finally secured one company of about 500 Chinese for one end of the work. We cross sectioned it all and laid the work out each morning for the Chinese. They worked in groups of 60 and we gave them as close to 4½ yards each as possible, a little over, if anything. They usually finished around 4 o'clock.

The rail head consisted of 4 tracks off a lead from the main line. There were 2 sets of 2 tracks each, the tracks were 14 ft. centers and 2 sets 80 ft. apart and 1,200 ft. long. Between the sets was an unloading court 60 ft. by 700 ft., which was paved solid with cross ties and had an 18-ft. road of cross ties leading to the main Bethune road, which was about 300 ft. away. This work was all exposed to shell fire, but it never suffered from any such disaster while we were there, although during the period of the work St. Pol, which is about six miles to the rear, was shelled every day. These shells used to whistle over our heads at about 4 minute intervals.

On the completion of this work, we had to double track a section of the railroad from Abberville to Revent. Our section was from St. Requet to Coulevilles. This was the only line of laterial communication left after the March drive. The line from Annes to Arras was not actually taken, but it was under shell fire and certainly was threatened. A good example of what, in our Yankee assuredness, we were pleased to call European stupidity and lack of progressive methods, was exhibited here. The section we were on was heavy work, the cuts and fills being about 50 or 60 ft. Most of the fills had been made for double track as well as part of the cuts. The single track ran down the center of the grade and the British and French authorities would not permit us to throw the track, so a great part of this good grade had to go to waste. They would not permit the existing main to be touched, claiming that if we attempted to throw it the interference to traffic would be more than they could afford. It follows, of course, that they refused to let us use the main line to haul dirt over. The only time we could use it was to unload ties and rail. We handled all the dirt by hand on meter-gage track with ½-yd. and 1-yd. Decauville cars.

After completing this double track we went back to the Nevers cutoff, which was quite a project. The line was 5½ miles long and was a short cut across a meander of the Loire river, which the Paris, Lyons, Mediterranean line from San Mojan had to negotiate on the way to Is-sur-Tille. The saving in mileage was slight, but the saving in elapsed time was from 12 to 24 hours. The P. L. M. at this point passed through the Nevers yard, which was also a junction yard with the main Paris lines from the

south. Considerable congestion was always prevalent here. The American Railroad forces were also building a divisional yard and engine terminal at Desease, which would replace the yards at Nevers for our trains. The line to be built involved about 200,000 cu. yd. of rock excavation and 300,000 cu. yd. of fill. There was also a bridge over the Loire river, which was perhaps 3,000 ft. long, the approach to which constituted one of the heavy fills, most of which was secured from side borrow. The fill was made by teams and wagons with a ½-yd. shovel. There were also four elevating graders drawn by tractors.

The bridge across the Loire was built with pile approaches and had 14-ft. spans. The river spans were 60 ft. girder spans on pile clusters. River piles were driven from either end with two steam hammers on scows and the approaches were driven by a steam track driver.

We placed the girders over the P. L. M. main line with a Bay City crane. The girders weighed about seven tons, so this was no particular problem, but it was of great interest to the French. They had their superintendent on the job with their division engineer; they came with many misgivings as what might happen to their track. They left, much impressed with our boys. They were never, however, sufficiently impressed to permit us to put a switch into their main line. Whenever it became necessary to cut the main line it became necessary to have the P. L. M. men do it.

What is to become of these projects we built was always a problem to us and probably is a big problem to the men that are now in France. Our contract with the French for the railroad work was made with the provision that if they operated over the lines, or the yards, or both, for a period of five years after the war, they should pay the actual cost of the construction as the purchase price for the properties. If they did not do so operate over them they were not to become involved at all. In other words, the lines were thrown back on our hands.

Reclamation in the Maintenance Department*

By J. G. Stuart,
General Storekeeper, Chicago, Burlington & Quincy, Chicago

Conservation, like many other good things, should begin at home. Too much care cannot be exercised in ordering supplies—whether they be for store stock or for special material which is not ordinarily carried in stock. Once an article is ordered that is not really needed we are very fortunate indeed if we are able to get 100 per cent of the value out of it, but if we can prevent the ordering of the article we have surely saved 100 per cent right at the beginning and have also saved the labor of ordering, handling and hauling.

The next step in conservation, and really one of very great importance, is proper care and handling of material. A great deal of money is lost to railroads every year by breakage, leakage and marring of material in various ways, which unfits it for service. These sources of loss can be materially reduced if supplies are properly handled and cared for.

Every man having to do with the handling of material, and particularly those who are handling it after it is unpacked, should be instructed, so far as it is possible, as to the nature of the material, the use to which it is to be put, the way in which it may be damaged, so that it loses its usefulness entirely, or at least is injured so that only partial service may be had from it. A great many articles, many of them of considerable value, are left exposed to the weather and thereby rendered almost valueless, or they are handled roughly and must be scrapped because of broken threads or other damage.

Finished lumber is often stored out of doors and considerable loss is occasioned by warping and splitting. It is a common sight to see a railroad lumber yard where practically all of the lumber is stored outside and only a short distance away a commercial lumber yard where the lumber of the same kind is under cover.

Track bolts are often piled outside and the nuts rust on the bolts to such an extent that considerable extra labor is needed when the bolts are put in the track. If it is necessary to store outdoors and the bolts are not oiled when purchased they can be easily oiled by immersing the keg in an oil bath at the time the bolts are received. The oil bath and the extra handling does not amount to more than a couple of cents per keg. Track spikes as well as bolts are often piled outside in such a way that the kegs are apt to fall apart and a great deal of extra labor is necessary to handle the spikes, although the contents may not be injured. Frogs and switches are generally piled outside and often rust badly. A little oil applied to the bolts and nuts will in most cases prevent the rust.

Reclamation

One phase of conservation that has come to the front very prominently is reclamation. Notwithstanding the exercise of every possible care in the ordering and caring for material, a great deal is still available for reclamation; material that has been used once and by repairs or reworking can be made fit for service again, or material that has been used and by a change in form may be made fit for other purposes.

Two objectives stand out clearly in reclamation. One is the need of the material after it has been reclaimed, and the other the fact that material can be reclaimed for less money than it can be purchased for. It is true that it often pays us to reclaim material, even though it costs decidedly more than it can be purchased for, but this can only be practiced in emergencies or when the item reclaimed is such as will enable us to put a far more expensive item into service. The constant danger in reclamation is that, unless stock is very carefully watched, material will be reclaimed even though it is not needed, merely because it has been the practice to reclaim it.

The maintenance of accurate and reliable records is essential to prevent the reclamation of material which will cost more than its purchase price new. One thing should be borne in mind at all times—that records must be correct. The saving made by reclamation will, of course, be the difference between the market value and the total cost of the reclaimed article (including its value as scrap, plus the value of any additional material used in reclaiming it, and the cost of labor, including supervisory and clerical forces and shop expenses). This cost should be checked up often enough to reflect the changes in market conditions or labor costs.

In most cases material which is fit for further use should be reclaimed at the point at which it is released—that is, as much of it as can be used at that point. Strict attention should be given to this to prevent long hauls to scrap docks and back to the point where the material will be used. Of course, all of the material cannot be

*From a paper presented at the annual meeting of the Railway Storekeepers' Association in Chicago on January 25.

reclaimed at the point at which it is released, therefore, plants with larger capacity and better facilities should be established at central points where the minimum haul will be obtained.

It is interesting to go over various roads and investigate the different practices and to note that one road effects large savings on certain items while on another road the same things are not reclaimed at all. No two roads seem to be reclaiming all of the same kind of material, so there is something for each one to learn from every other road.

Cattle guards, gates and sign posts may be made from scrap flues. Track spikes are reclaimed on most roads. One road has been reclaiming them and sorting them into No. 1 and No. 2; the better to be used in yard and other tracks where there is no great speed, and the No. 2, which are a poorer grade, to be used on tracks around shops, rubble car tracks and storage tracks. Old track shovels, when worn to such an extent as not to be serviceable on sections, can be used for stations, way cars, watch shanties and other places where a coal shovel or small shovel is needed. Tie plates, after having been in service, may be repunched and used with lighter rail. Frogs, crossings and switch points may be built up, either in the track or at scrap rail yards.

Cement sacks in all cases are returnable to the shippers. The great question is, does the store get back all of the empty sacks? To accomplish this one road is keeping a very careful check on all of the sacks of cement sent out, showing the car number, date of shipment, consignee, and point to which shipped and is tracing to see that the same number of empty sacks are returned after the cement has been used. Each individual job must be followed up or the best results will not be obtained. Men readily fall back into their old habits.

There is room for a great saving in the use of second-hand lumber. Roads are constantly taking out old bridges and, though the lumber may not be good enough for use in bridges again, it is satisfactory for other purposes. A resaw established in a lumber yard will generally pay 200 per cent per annum on the investment. In addition to cutting up and getting second-hand lumber in service it enables the lumber yard to furnish any odd size pieces that may be called for.

A New Method of Preserving Railway Ties*

BY H. K. WICKSTEED,
Chief Locating Engineer, Canadian National Railways

DRY WOODS or cellulose are almost indestructible by any ordinary agency such as a tie is exposed to. The bacterial growth requires moisture and oxygen for its development. It would appeal, therefore, that if we thoroughly dry a piece of timber, and keep it dry, it will last indefinitely. We know from actual experience that this is so. Everyone has used or seen old timber in the form of beams and joists taken from buildings two or three centuries old and perfectly sound. In these cases moisture has been excluded. Again, every one has seen or at any rate read of piles and foundation timber many centuries old in a perfect state of preservation. In these cases oxygen has been excluded. We all know that exposed timber will generally last longer when coated with paint or tar or some waterproofing material. The exceptions are where the timber has been waterproofed before it was seasoned, with the effect of retaining the moisture already in the stick and preventing its evaporation. Timber, even when air-dried for a considerable length of time, still contains 15 per cent or more of moisture, the percentage varying with the nature of the material and the size of the stick.

Another point not so well recognized or understood is that seasoning timber increases its strength by as much as 80 to 100 per cent in some cases over that on the green stick. It will be seen at once that, consistently with reasonable expense and loss of time, it is well worth while to dry not only ties, but timber of any kind used as a beam or strut, where strength is necessary. If we increase the strength by even 60 per cent, we require only 62 per cent of the amount of material, and, as this percentage is dry, while the other contains a very large amount of moisture, the saving in freight is very much more than the apparent 38 per cent. In Eastern Canada, at any rate, transportation is a very large item in the cost of our timber and is compelling us, as a matter of expediency, to use steel and concrete where we should use timber if it were readily available.

It being granted that drying or seasoning is extremely desirable, the question is as to the means. In the case of ordinary lumber, air-drying supplemented by a few hours in a kiln is fairly satisfactory. In that of dimension timber it is not so. First, because the air-drying in the case of large sticks takes years to accomplish, because the temperatures used in the ordinary kiln are so high as to injure the strength of the timber; third, because, even when carried on with the greatest care and deliberation, the outside laminae dry first and shrink before the heart of the stick has any chance, and this shrinkage causes checks and cracks which, for many purposes, render the stick useless.

When the "wooden walls of England" were a reality, the seasoning of large sticks was carried on by immersion in sea water for a period of three years, more or less, the saps and resins were dissolved and washed out, and the pores of the wood left open and filled only by water. The subsequent drying was then easily, quickly and uniformly carried on throughout the stick, and the resultant deposits of salt acted as antiseptics just as the creosote does in the modern process. This was perhaps the most perfect seasoning possible, or ever accomplished.

In experiments made in the last two years involving an entirely new process of drying timber an effort was made to use the same process that nature does, and dissolve, neutralize or wash out the sap and other liquids or semi-liquids which obstruct and close the pores, and to do this within a reasonable time, much faster than nature unassisted can accomplish the work. Hot water is more effective than cold water, and hot vapor of water is, in some cases, still more so. In the new process, which is simplicity itself in theory, although the best form of mechanical application took much time and thought to study out, warm vapor, or, in other words, warm air, saturated with moisture, is circulated among the ties. This opens and cleans the pores of the wood just as a Turkish bath does in the case of a man. The liquid components of the saps and resins filling the vesicles themselves, expand with the heat and force their way out, to be diluted and carried away by the warm vapor. After some hours of this treatment, the amount of moisture is reduced by very slow degrees, until, at the end, it is prac-

*Abstract of a paper read before the Canadian Railway Club, Montreal, Canada.

tically dry and the timber is removed with not more than 5 per cent of moisture left in it. The rapidity with which this is done depends upon the size of the sticks and the nature of the timber, just as it does in other methods, but no subject has yet been found which did not, in the end, yield to treatment. Care is taken not to let the temperature of the kiln get above 160 deg. F. so that no injury may be done to the fiber of the wood.

Timber so treated is, I believe, indestructible, except by fire, so long as it is kept dry. Even without further treatment, it will undoubtedly long outlast unseasoned material. It is, in this shape, in pre-eminently good condition to receive creosote, but we believe that creosote is absolutely unnecessary and that the elements of decay being altogether removed from the inside, all that is necessary is to keep them from entering from the outside. Some waterproofing coating is desirable, and in the case of ties a cheap one is the only one which can be used economically.

In the experiments conducted a heavy oil tar was found which is an almost worthless by-product of refineries. The ties were merely dipped in a hot bath of this material for a few minutes and, on coming out, were sanded by a sand blast to absorb any superfluous stickiness and make them easier to handle.

As a result of our experiments with these ties we concluded that they were in the right direction in the main, but that the asphaltic waterproofings were imperfect. They melted and ran under a strong hot sun; and when abraded, as was inevitable in the case of ties, the waterproofing was gone. Some of the more tarry products which penetrated the grain of the wood were much better, and we believe them to be very good.

We are unable to give accurate figures on the cost but estimate it about 30 cents. It may be that this could be brought down, but the cost of the plant would be much higher now than before the war. One of the principal items of cost is for fuel for drying and we all know the price of coal at present. I have some figures of the tests made at Trenton to show the weight of the ties and the amount of moisture that has been absorbed. The whole problem was whether or not we could successfully waterproof the tie and keep it dry. We tried asphalt, also coal tar pitch. We found that the asphalt was useless in many cases. Some poplar ties treated with it are rotten now, but poplar ties that had pitch applied are all right. The pitch has a penetrating quality which the asphalt does not possess. The ties now under test have been over three years in service. After 8 months ties examined had increased in weight about 2½ per cent. The next tie, taken out after 14 months, had been treated with asphalt. It had increased 13 per cent, while two pitch-treated ties taken out at the same time had increased 1½ per cent and 7 per cent. This last was a spruce tie. When in for two years two pitch-treated ties had increased 7½ per cent and 2.9 per cent, while a couple of asphalt-treated ties had increased 14 per cent and 16 per cent, showing the difference in the two treatments.

In November, 1917, one pitch-treated tie had gone up 7 per cent and another 17 per cent, but in this last case there had been a strip of bark left on one side of the tie, which allowed it to become exposed. In May, 1918, one had increased 12 per cent, one 5 per cent and one 10 per cent. In our kiln dried ties the moisture is down to 5 to 8 per cent, so that apparently we have, up to the present, kept most of the ties down below 15 per cent moisture, which we figure is required to even start bacterial action.

The prospect which is opened up by this process is something more than merely getting the equivalent of the creosoted tie at a less cost. It is, besides, the potentiality of using for ties timbers which are now useless for the purpose, or nearly so. The northern birch, for instance, is a strong reliable wood, used by the Indians for every purpose requiring a hard wood, but unavailable for ties or bridge timbers on account of its superabundant sap and its consequent tendency to rot quite rapidly.

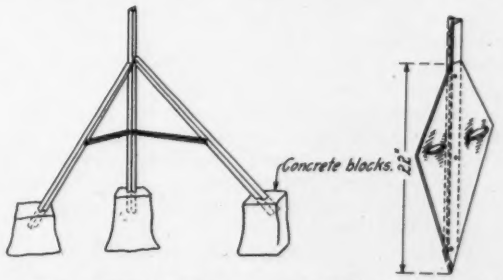
The poplar and the balsam are others for which there is at present practically no demand. These timbers are particularly interesting to us just now on account of the recent opening up by the railways of thousands of square miles of northern forests, of which, with spruce and jack pine, these are the main constituents. The use of these woods for commercial purposes means millions of dollars to the railways in reduced cost of ties as well as in freight.

A number of these ties have been put in the Canadian Northern track. Some of them have been taken up and tested for absorption of moisture and for signs of rot. I have one sample of a tie dug up only a few days ago which has been under the track in the Trenton yard for over three years, and I have also another sample of a birch tie which has never been under the track at all, but which shows how perfect the drying part of the process is and what a valuable timber birch is. All of you probably know what an absolutely worthless timber it is if used in outside work without seasoning, and the reason is unquestionably the amount of sap which it contains. If this is dried out and the wood sterilized, it is as strong and lasting as most other hardwoods and better than some. It is incidentally the only hardwood in Northern Ontario and Quebec.

THE IOWA STEEL FENCE POST

AN INTERESTING DEPARTURE from other types of steel fence posts in common use is seen in the Iowa steel post. This consists of a T-bar attached to a diamond-shaped plate. The posts are made of high carbon bars, 1½ in. by 1½ in. by ⅛ in. and come in three lengths, the 6-ft. posts weighing 9.2 lb.; the 6½-ft. posts, weighing 10 lb., and the 7-ft. posts, weighing 12.6 lb. each.

The T-bar is also used to form the special corner and gate posts which are imbedded in concrete bases. In the line post the resistance to displacement or pulling is accomplished with the aid of the diamond-shaped plate 22 in. long, the post being driven until all but 2 in. of this plate has been buried. Another advantage claimed for the diamond shape is that it facilitates driving. A particular feature of this post is the means provided for fastening the wires. The stem of the T-bar is punched with a series of hook-shaped slots into which the wires are inserted readily, yet in such a way as to be secure against removal. These posts are manufactured by the Iowa Steel Post Company, Waterloo, Iowa.



The Corner Post Detail of the Foot Plate

MAINTENANCE MEN IN RAILWAY ADMINISTRATION

A Roster of Those in Charge of the Repair and Improvement of the Properties and Their Experience

SINCE THE REPAIR and improvement of the fixed properties of the railways plays such an important part in their operation, it is only logical that recognition has been given to engineering and maintenance of way officers in the formation of the personnel of the United States Railroad Administration. However, the selection of engineers has not been confined solely to the strictly engineering work, but they are also represented on the Board of Railway Wages and Working Conditions, in the Forest Products Section and other departments of the government organization.

Reference has been made in these columns to the appointment of a number of these men as the announcement of their selection has been made public from time to time. However, a number of them have entered upon their duties without definite announcement having been made, while at no time have all of the engineering and maintenance officers in the Railroad Administration been grouped together. For this reason we refer briefly to those officers holding the more important positions in the Railroad Administration, who, by training and experience, have been closely associated with the maintenance or construction departments of the railways or whose present duties are of peculiar importance to the engineering officers. Their photographs are shown on the opposite page.

C. A. Morse, assistant director, division of operation, engineering and maintenance, is ranking officer in charge of maintenance of way matters in the Railroad Administration, this position having been created and his selection made effective on September 1, 1918. At the time of his appointment to this position Mr. Morse was chief engineer of the Rock Island System, which position he had held since March, 1913. Prior to his connection with that road he had spent 27 years with the Santa Fe during which time he rose from transitman to chief engineer of the system. Mr. Morse has also been active in the American Railway Engineering Association, of which he was president during the past year.

T. C. Powell, director of the division of capital expenditures, was appointed to this position on January 16, succeeding Robert S. Lovett, who resigned to become president of the Union Pacific. Mr. Powell was formerly vice-president of the Southern railway and during 1918 was a member of the Priorities committee of the War Industries Board and the representative of the Railroad Administration on this Board. As director of the Division of Capital Expenditures he is in charge of all improvement work involving charges to capital account in excess of $1,000.

E. E. Adams, engineering assistant to the director of the division of capital expenditures, was consulting engineer of the Union Pacific System, with headquarters at New York and accompanied Judge Lovett to Washington when he took charge of this division on its formation early in 1918. Mr. Adams was assistant to John D. Isaacs, consulting engineer of the Harriman Lines prior to the separation of the Union Pacific-Southern Pacific properties and was made consulting engineer of the Union Pacific at the time of the dissolution. In his present position Mr. Adams has direct charge of engineering matters in the important Division of Capital Expenditures.

G. J. Ray was granted leave of absence as chief engineer of the Delaware, Lackawanna & Western on February 1, 1919, to become engineering assistant to the regional director of the Eastern region. Mr. Ray has been chief engineer of the Lackawanna for 10 years, previous to which he was division engineer on this road for 5 years. As engineering assistant to the regional director he replaces an advisory committee which was formed early in 1918.

E. B. Temple, engineering assistant to the regional director of the Allegheny region, was assistant chief engineer of the Pennsylvania Railroad prior to his appointment with the Railway Administration in July, 1918. Mr. Temple's entire railway experience of 28 years has been with the Pennsylvania Railroad, with which system he rose from an assistant on corps to assistant chief engineer, being appointed to the latter position on March 1, 1906.

H. N. Rodenbaugh, engineering assistant to the regional director of the Southern region, was an engineering staff officer in this region prior to his appointment as engineering assistant in January of this year. Previous to his connection with the Railway Administration he had been in the engineering department of the Southern Railway.

J. E. Crawford, who is acting as engineering assistant to the regional director of the Pocahontas region, is also chief engineer of the Norfolk & Western, which position he has held since May 1, 1913. Previous to his appointment as chief engineer he was bridge engineer of the same road.

J. L. Haugh, engineering assistant to the regional director of the Northwestern region, was engineer of capital expenditures prior to his appointment as engineering assistant late in 1918. Previous to that time he had spent 13 years in the engineering department of the Chicago & North Western, rising to the position of assistant to the chief engineer.

H. R. Safford, engineering assistant to the regional director of the Central Western Region, was for 8 years chief engineer of the Grand Trunk. Previous to that time he spent 15 years in the engineering department of the Illinois Central on which road he was chief engineer maintenance of way from 1906 to 1910.

E. A. Hadley, engineering assistant to the regional director of the Southwestern region, was chief engineer of the Missouri Pacific-Iron Mountain System from May, 1915, until July 1, 1918, when he accepted his present position. For the five years previous to his appointment as chief engineer of the Missouri Pacific he was engineer of design on the same road.

C. E. Lindsay is an engineering member of the Board of Railway Wages and Working Conditions, having been division engineer of the New York Central at Albany, N. Y., until June 1, 1918, when he was appointed as one of the three railroad officers on this board. Prior to his appointment as division engineer of the New York Central in 1901 he was in the engineering department of the Pennsylvania Lines and the Southern for 15 years.

John Foley, associate manager of the Forest Products Section of the U. S. Railroad Administration, is also forester of the Pennsylvania Railroad, a branch of the maintenance of way department. In this position he has charge of the purchase and treatment of ties and timber, which experience is valuable for him in his present position in charge of technical matters involved in the purchase and treatment of timber.

John Foley,
Associate Manager, Forest Products Section

G. J. Ray,
Engineering Assistant, Eastern Region

E. B. Temple,
Engineering Assistant, Allegheny Region

J. E. Crawford,
Engineering Assistant, Pocahontas Region

E. E. Adams,
Engineering Assistant, Division of Capital Expenditures

C. A. Morse,
Assistant Director, Division of Operation

T. C. Powell,
Director of the Division of Capital Expenditures

C. E. Lindsay,
Member Board of Railway Wages and Working Conditions

H. N. Rodenbaugh,
Engineering Assistant, Southern Region

J. L. Haugh,
Engineering Assistant, Northwestern Region

H. R. Safford,
Engineering Assistant, Central Western Region

E. A. Hadley,
Engineering Assistant, Southwestern Region

Engineering and Maintenance Officers in the Railroad Administration

VALUE OF WATER TREATMENT DEMONSTRATED

A Marked Saving in Coal was Accomplished following the Installation of a Softening Plant

A SAVING of the entire cost of a water softening plant in less than two months' time through the resultant economy in the fuel used in locomotives constitutes an unusual demonstration of the value of water treatment. This, in short, is the nature of the results secured by a contractor on railroad construction in the boilers of two steam shovels, six locomotives and two hoisting engines. The demonstration is especially conclusive because the isolation of the equipment limits its supply of water to a single source and because the record of performance gives a check not only on the total quantity of fuel but also on the relative amount of fuel used per unit of equipment performance.

The Walsh Construction Company of Davenport, Ia., contractor for the grading for the new Markham yard of the Illinois Central at Homewood, Ill. (near Chicago), found the water upon which it was dependent for its boiler supply so unsatisfactory as to cause serious difficulty in the operation of equipment. As a result, a water softening plant was installed which treated all the water used in the boilers after October 27, 1918, and records of the fuel used before and after the installation of the softener constitute the basis for the conclusions reached with regard to the fuel economy. Some data were also secured on the cost of the boiler repairs which also bear out established conclusions on the value of water treatment.

The water used was taken from a drilled well 170 ft. deep, the consumption being about 40 gal. per min. An analysis of this water made on September 26, 1918, which is reproduced below, shows that the water contained a considerable quantity of incrusting solids.

Silica	0.677	grains per gal.
Oxides of Iron and Aluminum	0.093	" " "
Carbonate of Lime	9.794	" " "
Sulphate of Lime	3.916	" " "
Carbonate of Magnesia	10.776	" " "
Sodium and Potassium Sulphates	13.704	" " "
Sodium and Potassium Chlorides	1.360	" " "
Loss, etc.	.209	" " "
Total Mineral Solids	40.529	" " "
Organic Matter	Trace	" " "
Total Incrusting Solids	25.256	" " "
Total Non-incrusting Solids	15.273	" " "

This water was used in six 46-ton, six wheel switching-type locomotives having 155 2-in. flues, 13 ft. 6 in. long operated at 180 lb. pressure. There were also two 70-ton steam shovels equipped with locomotive type boilers approximately equal in fuel and water consumption to the locomotives in use. In addition there was one 40-hp. locomotive-type boiler and one 25-hp. upright boiler, both used for hoisting engines. All of the boilers were in good condition when the work was started on July 24, 1918. The normal operation of the plant on the day shift was two steam shovels, four locomotives hauling dirt, one locomotive switching and spreading, and one locomotive for reserve. On the night shift one steam shovel was operated and three locomotives were used in hauling and spreading.

With water of the kind available, trouble was experienced in a short time because of the formation of scale in the boilers, which had attained a thickness of ⅛ in. to ¼ in. by the time it was concluded to install a water softener. As matters grew worse, there were engine failures almost daily, and practically all stay and crown bolt flues and mudrings were leaking more or less. Repairs were good for about three days on the average, the time to make the repairs being from three to five hours on each boiler.

One of the engines was in need of new flues and it was estimated that it would be necessary to remove all flues and many stay bolts in the rest of the boilers within two or more months. Electric welding of the flues helped for some time, but in three weeks the leaky condition was about the same as before the welding, although undoubtedly it would have been worse had no welding been done. Trouble was also being encountered with leaky boiler checks, pumps and lubricator valves, while the throttle packing was eaten or corroded by the water. Matters were not as bad as they might have been owing to the fact that there was practically one locomotive on reserve at all times, so that the boiler work on the locomotives did not interfere seriously.

As a consequence of these conditions studies were made of the possibilities of installing a water softener, and a plant was finally arranged for, which was completed ready for operation on October 27. This consisted of temporary equipment supplied by the Railroad Water and Coal Handling Company of Chicago. It was composed essentially of a tank of 10 ft. diameter inside an 18-ft. diameter tank, both tanks being 18 ft. high. In addition to these tanks there was a shallow mixing box mounted on top.

The operation of this equipment is explained as follows: Raw water and reagents are pumped independently into the mixing box, from which they pass as a mixture through a 10-in. pipe extending almost to the bottom of the inside tank. The water escaping in this tank rises upward in the tank slowly while the chemical action is taking place, the solid matter percipitated in the meantime being deposited for the most part in the bottom of the tank, which is equipped with a sludge valve through which the sludge may be allowed to escape at intervals. As the treated water approaches the top of the interior tank it encounters a filter which consists of a diaphragm of excelsior interposed between two grids of wooden slats. Passing through this filter the water reaches the top of the interior tank, where it is allowed to escape into the outside tank through two 4-in. pipes extending from the top of the inner tank to near the bottom of the outer tank, the latter serving as storage for the treated water.

The treating plant was placed in service on October 27. In the period from September 6 to October 27 there were a total of 650 boiler shifts in the course of which an average of 4.2 tons of coal per boiler shift was used. Considering this with the quantity of earth moved by the contractor during this period, it is seen that the cost of the coal used per cubic yard of earth handled amounted to $.0306 per cu. yd.

For a period of not quite two months following the installation of the water softener the coal consumed amounted to 3.1 tons per boiler shift at a cost of only $.0204 per cu. yd. of material graded.

As in all other cases where water softeners have been ifistalled, supplying water for equipment that has been badly incrusted with water that had not been treated, considerable trouble was experienced with foaming as the scale in the boilers was loosened. This necessitated the use of anti-foaming compounds. Some difficulty in the

treatment has arisen from the fact that the water obtained from the well is muddy. An increased consumption of water of from 40 gal. per min. to 100 gal. per min. about the time that the softener was installed may be responsible for this condition.

Later information on the coal consumption shows that in the period from December 23 to February 1, during which a total of 437 boiler shifts were worked, the average consumption of coal was 3.8 tons per boiler shift. In a fourth period from February 1 to February 28 inclusive, during which 314 boiler shifts were used, the average coal consumption was 3.3 tons of coal per boiler shift.

In addition to the data on fuel economy the following information is available with respect to the boiler work done on the engines before and after the inception of the water treatment.

Aside from this there were several items of special expense on the boilers that cannot be included readily in these statistics. For instance, before the water was treated considerable expense was incurred in electrically welding the flues, amounting to $233.33 per boiler.

BOILER WORK COST ON BOILERS USED BY CONTRACTOR IN MARKHAM YARD

Untreated water period, for two months previous to using treated water:

	Average per day	*Per boiler day*
Boilermaker, 12 hr.	$ 7.85	
Boilermaker's helper, 12 hr.	4.80	
Total cost	$12.65	$1.405

Treated water period during January and February:

	Average per day	*Per boiler day*
Boilermaker	$0.62	$0.07

The Efficient Utilization of Labor

BY W. C. NISBET.

ONE OF THE MOST common duties of maintenance engineers is to scrutinize the supply of labor or the number of workers on the payroll and to try and have the gangs kept up to the limit permitted by current appropriations. An unfortunate feature of this obligation is that no infrequently there exists a feeling among those who themselves have not actually worked gangs of trackmen that it is enough if the gangs are full, that the best utilization of the labor furnished results automatically and that the supervisor, in spite of his manifold duties, will some way, somehow, evolve improved methods and train the men and the foremen in short cuts and simplified operations. To unload this responsibility on the supervisors is unresonable, as they are completely occupied with seeing that existing standards are adhered to without evolving new ones. Nor can the result be attained all at once by those in higher authority "raw-hiding" the division engineers when instances are observed of too many men being assigned to a job, of men bunched in surfacing or self-evident cases of improper methods.

The need is for general standards of methods of work and of organization of gangs applicable to the whole railroad, and issued with authority just as a standard turnout plan is issued and the result of as careful, intelligent investigation by employees assigned to the special task. The scientific and analytical training of the engineer peculiarly adapts him for such work if supplemented by the practical experience of trackmen.

VARIATION IN ACCOMPLISHMENT.

It is a common error to assume that each name on a payroll means a definite and fixed amount of work performed daily, and to confine our worries to the "shortage of labor." The fact is that more may be accomplished with a 50 per cent labor supply well supervised and using the best methods, than with a 150 per cent labor supply doing the work any old way, under mediocre foremen. Every variation of accomplishment from practically zero to nearly 100 per cent can generally be found among the track laborers on a sub-division depending on the following and other factors:

1. Ability of foreman, in
   (a) Planning work ahead.
   (b) Short cuts or quick methods.
   (c) Placing the men while working.
   (d) Energy.
2. Incentive offered for accomplishment.
3. Type of labor furnished.
4. Feeding and housing.

The "type of labor furnished" is purposely placed near the foot of the list, as it is the firm belief of the writer that except for the very highest grade of native labor or the worst "bar-flies" the ability of the foreman is of greater relative importance than the grade of trackmen available.

It appears evident, therefore, that when maintenance engineers convene for mutual help, they will do well to devote time to planning how to organize to determine standard methods, and enforce them, for it is likely that the present labor shortage will become worse instead of better, even after the war, for no foreign nation will have spare man power at that time. The thing to do is clearly indicated—to shorten and simplify all manual operations, eliminate lost motion and all non-essentials, set standard methods and times based on these factors and finally to take steps to see that the recommended practices are followed. It is common at conventions and committee meetings to investigate and discuss technical matters like the coning of car wheels, the form of cut spikes, the chemical composition of wood preservatives, etc., all subjects doubtless of great importance, but it is hoped that some time will also be given to the consideration of how to utilize most fully the present restricted supply of labor by defining and standardizing methods of work and evolving short cuts.

If a railway should decide to investigate the existing methods and to define improved ones, it is to be hoped that it will avoid using a committee for the purpose. However popular that custom may be, human nature, when working as a member of a committee, seems inclined to leave the work for the others to do, or if not that, the members frequently are prevented from attending the meetings. Other than the above the committee method often gives undue weight to the member with the loudest voice. A very desirable way to attain some fixed purpose, such as that under consideration, is to assign some individual to the job of outlining and organizing the work, with certain others reporting to him and handling such details as he may direct.

In case anyone thinks the labor wastes in track work are insignificant, let him consider the following figures: Taking the ideal as 100 per cent, and assuming that an attainment of only 80 per cent is made owing to the over-assignment of men to different jobs, the result is 80 per cent. If a percentage of 75 is reached in the method of work the attainment now becomes 80x75, or 60 per cent. This will be reduced still further if there is no incentive. Suppose for lack of this stimulation the exact percentage is but 66⅔; then the dependent sequence becomes 60x66⅔, or 40 per cent final efficiency. The labor wastes are then 60 per cent, if the assumed percentages are correct (if anything they are too liberal, e. g., 75 per cent efficiency for "methods"), and if the operations are in sequence. In the following paragraph the subject is analyzed in units of men to show this sequence and to make the conclusion more apparent to those who wish to study it more thoroughly:

Suppose we have a gang of 10 men, in which the foreman has the common but unfortunate custom of assigning or allowing more men to the different operations than are necessary, e. g., when carrying ties a third man is allowed to walk along, taking hold of the tie; five men are sent with the hand car where four are sufficient; one man is permitted to stand and hold the tie up against the rail with a bar or shovel while tamping, which is an unnecessary measure if the spikes are settled before the tamping begins. The result of this practice in many gangs reduces the working force to 80 per cent of the original amount or to the equivalent of 8 men. These are all that are productively employed, and the fact that there are 10 on the roll and present does not alter this fact.

DOING THE WORK

Next, as to the methods employed. We now have 8 men available. In nearly all operations there are short cuts and there are round-about methods which result in reduced output. For instance, in clearing around yards, if the lumps of coal and the cinders are thrown over the bank with small shovels the work goes slowly; but if spike kegs, boxes or large shovels are used to carry and dump the debris, much faster progress is made. Again, when tamping, some men will stand and tamp until the ballast is driven out on the other side of the tie, if the foreman is not vigilant. Further, when unloading ballast, if the foreman assigns the men properly, sees that the catches on the pockets are free and explains what each man is to do, the work can go on rapidly; but if these things are not done the job will be unsatisfactory and slow, stone will be unloaded in heaps (to be moved later at considerable and unnecessary expense), and cars will be derailed. There are, therefore, great possibilities in good methods, predetermined and standardized, and to call the usual average 75 per cent is conservative. This means that but 75 per cent of the 8 men usefully employed are necessary or that the excess over 6 men are wasted.

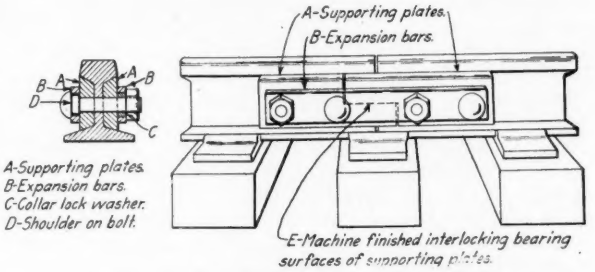
The effective force is now the equivalent of 6 men. In the previous analysis the effort of the men, if working for day wages, was estimated to be but 66⅔ per cent, or two-thirds of what they will accomplish if working for pay in proportion to output. Therefore the output of the six men will be reduced to what four might perform if the latter are paid for accomplishment.

If, therefore, by improved methods, short cuts and rewards judiciously applied four men can do as much or can do one-half, or can do any approximation of as much as ten men could do by the old methods the scheme surely offers a welcome relief from the present very real and acute labor shortage.

A RADICAL DEPARTURE IN SPLICE BAR DESIGN

THE RETENTION of uniform flexibility of the rail through the joints while at the same time allowing the rails freedom for contraction and expansion without imposing stress upon any part of the track structure, are the principal features claimed for a splice bar which has recently been perfected. This splice is known as the Interlocking Rail Joint and consists of two distinct parts: (1) the interior supporting plates which provide the bearing for the rail ends, and (2) the exterior or expansion bars which act in the capacity of links, preventing the abutting rails from separating beyond the limits allowed for contraction and expansion.

The supporting plates (four in number) are of steel, and are made to fit the web of the rail. Two of these plates are fastened to the ends of each of the rails to be spliced and the machine-finished interlocking bearing surfaces, which are shown in the drawing, when brought in



Section and Elevation of the Joint

contact, hold the rail ends in true surface. In contraction and expansion these plates move with the rail to the limits provided in the expansion bars which are also of steel.

It is claimed that flexibility through the joint is secured by the proper proportioning of the metal in the supporting plates and the freedom for contraction and expansion by the construction of the exterior bars and the bolts, which are special. The bolts are provided with a shoulder under the head of the proper size to pass through the bolt holes in the expansion bars with a depth slightly in excess of the section through the expansion bars.

When service tight this shoulder bears against the supporting plate and prevents the head from binding against the expansion bar. The nut is prevented from coming to a bearing on the opposite expansion bar by a heavy collar lock washer which transfers the pressure against the supporting plate. The drilling in the supporting plates and the rails is the same, insuring a neat fit of the bolts and when the nut is applied there can be no relative motion between the plates and the rails. The expansion bars are provided with longitudinal holes for the free motion of the bolts as the rails and supporting plates move with the forces of either contraction or expansion.

Under varying conditions of main line service these joints have been found to give satisfactory results. In one stretch of main track one-half mile long subjected to very heavy traffic, and laid with 100-lb. rail on cinder and gravel ballast, the joints have, after nearly three years of service, been found to be standing up well and producing good track. These results have been obtained with very little maintenance due to the scarcity of labor. These joints are being placed on the market by the Interlocking Rail Joint Corporation, of New York City.

LOOKING FOR UNSAFE CONDITIONS IN TIMBER BRIDGES

Some Thoughts on the Nature of Defects in Structures Which Demand the Attention of Maintenance Officers

IT IS difficult to distinguish between a safe and an unsafe condition in a wooden structure. What might be permissible under one set of circumstances might be positively dangerous under other conditions. On a steel bridge the inspector looks for wear or loosening of joints, indications of fractures and the extent of corrosion, all of which are usually surface manifestations. Even though the rust may be very thick, if it is scraped off the sound metal is exposed beneath and the amount of this still remaining may be readily measured. In the case of a timber structure, on the other hand, the question is one of possible defects throughout the body of the wood. While the actual decay may be apparent from the outside, this is not always the case, and especially in old structures there occurs a reduction in the strength of the material through a slow deterioration of the wood substance. This condition must be judged by any evidences that the wood is becoming soft or dosey and by indications of weakening, such as crushing of the fibers when subjected to cross grain compression.

Thus it is seen that the problem of determining whether a wooden structure may be carried over or must be renewed is far from simple and the man charged with this work should receive the benefit of all the data available on the subject. The observations on this important matter presented below are based on information obtained from A. F. Robinson, bridge engineer, Atchison, Topeka & Santa Fe System, Chicago, Ill.

Bridge Ties

Ordinarily ties are removed because of mechanical wear rather than rot. The ordinary cause for removal is rail cutting aided by "spike killing" and sun checking. Douglas fir ties have been known to separate into layers along the annual rings, giving the effect of unrolling like an onion. The ties do not last as long as the other parts of a bridge. For instance, on one 400-ft. trestle only 10 per cent of the original ties were in place after 12 years. In deciding whether or not the ties must be renewed, the criterion is that they must have sufficient strength to prevent serious breaking or bunching in case of a derailment.

Stringers

It is especially difficult to say just when a pine stringer is unsafe or should be taken out of service. In more than 20 years of service on one road, very few cases were noted where the stringers were actually rotting and getting soft. In these cases the timber was soft on top for 1¼ in. of the depth, and when removed the stringers were found to be getting very dosey and weak. They were not taken out a minute too soon.

In general stringers are replaced because they are evidencing a loss of strength through excessive age; nevertheless age is no criterion for renewal. Bridges have been rebuilt where the stringers were only 10 or 12 years old, and investigation showed that it would not have been safe to reuse very many of them. On the other hand, there are stringers with 16 to 18 years of service that have not commenced to show signs of decay or excessive deflection.

When stringers lose their strength they begin to break, and this is about the most conclusive evidence that they need to be renewed, it being assumed, of course, that there are enough stringers in the panel to keep the stress within reasonable limits for the train loading carried. Fortunately experience demonstrates that only one stringer of a chord will break at a time, so there will be plenty of warning before another one in the same span is broken. An engineman can readily tell when his engine breaks a stringer as he rides over the bridge. The deflection of the stringers should also be noted, but as long as this is not sufficient to make uncomfortable riding, the stringers need not be removed unless the breakage is excessive.

The conditions outlined above will suffice in most cases for bridges subjected to climatic conditions similar to those along the lines of the Santa Fe. There are, of course, circumstances under which decay may be a much more important consideration. Under such circumstances rotting or excessive softening of the wood must be carefully watched. The sticks should be prodded with a brad-awl or a knife and examined for a tendency to crush down over the cap. When the packing of the stringers in the chord is such that the sticks are in close contact for all or a part of their length considerable decay may take place which is not apparent from external observation or from the action of the span under load. Such conditions must be watched carefully.

Caps

Where piles are properly spaced, bents with broken caps can frequently be run for some time by installing what would be called minor repairs. These would consist of an extra sub-cap on top of the old one or of pieces spiked to the side of the cap. As a general rule it is safe to take a good many more chances with caps than with stringers or ties. If the cap is not splitting or crushing badly it can be used until it actually begins to break down or until the timber begins to rot.

Piles

When the piling is properly spaced and thoroughly driven it can be run with safety until there is less than 4 in. diameter of good timber at the ground line for hardwood and about 6 in. for soft wood piles. This rule is also subject to variations with climatic conditions. While 5 or 6 in. of good timber would justify carrying over a pile in northern territory where decay is relatively slow, it would be necessary to have from 8 to 10 in. of

sound wood in a pile subjected to a warmer and more humid climate where decay is more rapid.

The piles in a bent do not all wear equally well. Frequently one or two piles in a bent will fail some years before the others are worn out. When this occurs a cripple is inserted, the pile is cut off below the point of rot and a post put in on top of it, or the decayed portion is cut out and a short block is inserted with enough scabs to splice it thoroughly to the parts above and below. In doing this it is necessary that the bent is adequately sway-braced.

FRAME BENTS

As a general proposition the posts and sills in frame bents can be run until the timber actually begins to crush down, this without much reference to the age. Of course, when the timber gets soft so that one can poke a brad-awl or penknife blade full length into it, it is time to have it removed. In many cases the sills will rot or fail a long time before the posts do. In cases of this kind a second-hand sill can be installed. These sills, however, like the caps, seldom break in service and do not need to be replaced until the timber starts to crush down badly under the posts.

WOODEN TRUSS BRIDGES

Wooden truss bridges must be watched more closely than trestles because of the more serious consequences attending the failure of any main member under load. Like bridge stringers, the members of a Howe truss deteriorate through weakening of the wood rather than from decay, and under proper care may last many years. The task in inspecting one of these structures is to look for evidences of weakening. The members should be prodded with an awl or even bored with a small auger to note if the interior wood is still hard and bright. It is also necessary to note any tendency of the chords to crush across grain under the angle blocks or at the end bearings, or for the fibers at the ends of the posts to broom. The tension chord splices should be examined to see if the abutting ends of the chords are pulling apart through weakening of the timbers in the splice. If the camber is continually coming out of the span it is a sign of weakening of the timbers. Pile piers under a truss span should be considered the same as the bents in a trestle, making due allowance for the greater loads they carry.

INSPECTION

To pass upon the condition of a bridge in the light of considerations such as those referred to above it is necessary that the structure be inspected thoroughly and at frequent intervals by someone competent to assume the implied responsibility. Regular inspections should be made at intervals of not over three months by a division bridge inspector, whose duty it is to find out what condition the bridges are in and report any objectionable condition as soon as he discovers it, rather than to determine what should be done.

At least once each year an official inspection should be made by officers of the engineering or maintenance of way departments concerned with the care of bridges. Inspection of individual bridges may be required at more frequent intervals and should be made whenever necessary. The party should include the district or division engineer, the master carpenter and if possible the bridge engineer. Those making the inspection should not be concerned at the time with matters foreign to bridge work, and the time allowed for the trip should be adequate for detailed, painstaking examinations. A stenographer should be present to take full notes on the observations so that complete detailed information will be available for a careful study of the structure.

EXPORTS OF TRACK MATERIAL

THE BUREAU of Foreign and Domestic Commerce, Washington, D. C., has issued statistics showing the exports of railway track material during the month of January, 1919, classified according to countries to which they were assigned. These figures show that the exports of railroad spikes amounted to 3,509,054 lb. at a value of $189,408, while the exports of rail amounted to 65,024 tons, valued at $4,422,563. Frog and switch material aggregated $543,330.

United States exports of railway track material, by countries, during January, 1919.

Countries.	Railroad Spikes		Steel Rails		Switches, Frogs, Etc.
	Pounds	Dollars	Tons	Dollars	Dollars
Belgium	422,920	16,606	1,271	113,590	10,850
France	1,016,800	75,427	25,848	1,539,257	102,765
Italy	...	...	13,025	865,920	142,575
Netherlands	...	...	293	18,196	385
England	...	...	373	20,079	...
Canada	587,840	16,965	2,638	107,338	31,390
Costa Rica	800	68	...	...	...
Honduras	2,000	100	11	1,200	1,296
Nicaragua	1,300	100	7	500	104
Salvador	500	33	20	1,949	400
Mexico	98,545	6,241	101	8,845	10,365
Barbados	14,118	800	81	7,626	...
Jamaica	6,000	416	33	2,066	338
Trinidad and Tobago	...	...	...	...	1,350
Other British West Indies	3,000	210	14	906	2,164
Cuba	542,669	24,124	5,125	324,318	27,444
French West Indies	800	65	...	...	73
Haiti	...	...	...	...	355
Dominican Republic	14,850	1,547	56	4,000	773
Brazil	75,200	6,428	105	7,860	10,074
Chile	150,160	9,405	...	...	20,945
Colombia	12,300	950	545	30,239	1,240
Ecuador	20,000	1,340	...	...	81
British Guiana	...	...	38	5,082	...
Peru	103,900	7,157	294	19,379	13,455
Uruguay	...	...	...	...	47
Venezuela	2,496	420	22	1,580	165
China	...	...	899	61,169	10,358
British India	...	...	...	...	168
Straits Settlements	18,817	1,124	99	6,778	3,550
Dutch East Indies	...	...	372	36,277	14,727
Japan	257,823	13,161	7,533	627,748	44,936
Russia in Asia	100,890	3,312	5,558	363,638	43,469
French Oceania	3,200	285	...	...	...
Philippine Islands	51,126	3,124	663	46,023	44,328
Belgian Kongo	...	...	...	...	3,160
Total	3,509,054	189,408	65,024	4,221,563	543,330

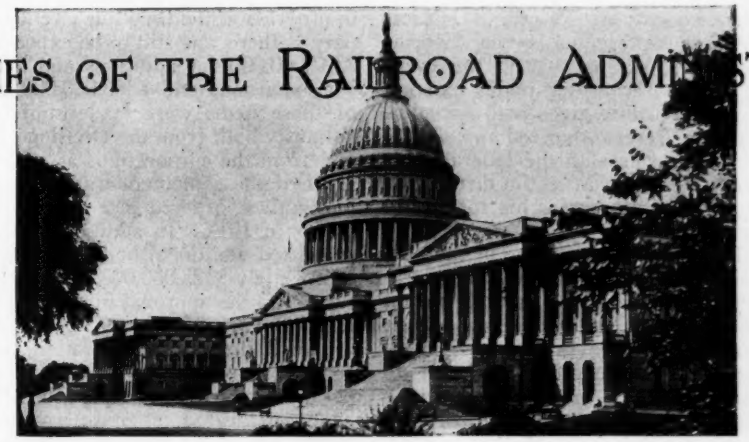
ELIMINATING TELEGRAMS

A REDUCED CONGESTION of telegraph wires and the saving of a large amount of time for the operators has been accomplished on the St. Louis-San Francisco by the systematic use of "traingrams," or railway mail letters, sent under an arrangement that provides for expeditious handling and delivery. During the month of December, 1918, a total of 33,418 traingrams, or an average of 1,078 a day, were handled. Since it is estimated that 75 per cent of this business, or an average of 809 messages per day, would have been handled by wire had the system not been in use, it is readily seen how large a load was taken off the telegraph service.

The secret of the system is to make the traingram service so dependable that officers and employees of the roads will have sufficient confidence to use it in place of telegrams in all cases where the traingram service will be fast enough. This is accomplished largely through a system of records by which the individual responsible for any delay incurred in the delivery of a traingram may be readily detected. It also provides for the consolidation of these messages at all important points in single envelopes delivered to the train baggagemen so that all mail of his kind is handled in a distinctive blue envelope which may be "tied out" separately from the rest of the railroad mail to expedite its handling at terminals or intermediate points. The messages are delivered and taken from trains by special messengers. The system has been in use on the St. Louis-San Francisco for over four years and has proved entirely satisfactory. The loss of a traingram is as rare as the loss of a telegram.

ACTIVITIES OF THE RAILROAD ADMINISTRATION

General Uncertainty in the Maintenance and Improvement Program



Charges for Construction Equipment Rules for Industry Tracks

Washington, D. C.

ALL RAILROADS under federal control have been instructed to prepare a maintenance program for 1919, to be submitted to Washington by April 1, if possible, which is to be measured by the amount of upkeep necessary to make the average for 1918 and 1919 equal to the upkeep during the test period of three years ending June 30, 1917, after making allowances for the differences in prices of labor and materials and extraordinary expenditures, as provided in the standard compensation contracts between the government and the railroads. These instructions have been issued to all regional directors in a letter from C. A. Morse, assistant director of the Division of Operation in charge of engineering and maintenance. In the letter Mr. Morse said in part:

"We want to get out a maintenance program and budget for 1919 on each railroad in order that we may be able to have some check on the expenditures for maintenance and on the relation of the same to the expenditures during the test period and to expenditures during the year 1918."

For the purpose of getting this information in comparable form, blanks were submitted with the letter, consisting of three sheets, the first arranged to show the expenditures under each primary account for maintenance of way and structures expenses as regards labor and material. The first column shows the average expenses during the three years of the test period, the second column shows these equated on the basis of 1918 labor prices, the next column shows actual expenses during 1918, and column six shows the increase or decrease. Column seven shows the estimated expenses for 1919, which really means the proposed expenses for 1919. Mr. Morse's thought is that in working up the budget for 1919, after taking into account any possible variation in wages between 1918 and 1919, the 1919 expenses should be the equated average expenses of the test period, plus any increase during the year 1918 or minus any decrease during 1918. Such a budget would exactly equal the average equated expenditures during the test period. Mr. Morse points out that this solution worked out in all cases on all roads, particularly as regards ties on a number of roads where the tie renewals last year fell behind and there is no possibility of getting in enough ties in 1919 to make up the shortage.

After arriving at the estimated expense for 1919 the detailed maintenance program should be worked out to fit as nearly as is practicable to these figures.

Sheet two covers miscellaneous charges and credits and the total of labor, material and miscellaneous charges and credits. On sheet three it is intended to show extraordinary items of expenses which are outside of the ordinary maintenance of the property and are set aside on this sheet to permit their elimination from the other maintenance expenses.

Similar data much more in detail is called for in Circular No. 28 of the Division of Operation, which had not been completed when instructions regarding the make-up of the proposed budget were issued, for the purpose of affording a comparison of the expenditures for maintenance of way and structures to measure the amount of upkeep during the three-year test period. This circular is accompanied by five blank forms calling for information as to each property under federal control regarding the expenditures in the years ended June 30, 1915, 1916 and 1917, and December 31, 1918. The contracts between the government and the railroad companies specify that such an analysis of the maintenance of way and structures expenses may be made at the end of each year of federal control. An explanation of the forms and instructions for furnishing the information which is to be forwarded to Mr. Morse by May 1 is given in detail in the circular

Capital Expenditures

The entire program of capital expenditures for this year, including the carry-over from the 1918 budget, is being reconsidered in the light of the financial situation caused by the failure of the railroad appropriation bill and not only will new work not be started without further approval, both by the corporate officers and the Division of Capital Expenditures, but work already under way will be discontinued except with their approval, except where necessary to insure safety or where it would cost more to stop it than to continue it. This plan was agreed upon at a conference held on March 13 between T. C. Powell, director the Division of Capital Expenditures, and Howard Elliott, of the railway executives' committee, which had previously conferred with Director-General Hines, and was announced in D. C. E. Circular No. 20, issued by Mr. Powell. Mr. Powell had previously issued D. C. E. Circular No. 19 for the purpose of emphasizing the fact that capital expenditures for this year must be financed generally by the railroad companies and requiring that the definite position as to approval or disapproval of the corporate officers should be secured before any work costing more than $1,000 should go forward, whether carry-over or new work. In some cases the corporate officers had agreed to finance certain additions and betterments chargeable to capital account, but because of the inability of the Railroad Administration to pay the amounts due them on account of rental for 1918 they had expressed a desire to review their authori-

ties and after the conference with Mr. Powell, Mr. Elliott sent a telegram to all roads represented by the Association of Railway Executives, stating that in the event corporate officers desired to reconsider under existing conditions any approvals heretofore given both for additions and betterments they were authorized to take up the withdrawal of such approvals with the federal managers, who would report the situation to the director of the Division of Capital Expenditures for his special instructions.

D. C. E. Circular No. 19 stated that it is not the purpose, generally speaking, of the Railroad Administration to make improvements chargeable to capital account unless the company finances the project. It stated that the corporation officer might desire to express general approval of the project without committing himself as to finances and in that case such projects should be submitted separately with the comments of the corporation officer and the recommendations of the regional director. Improvements were generally classified into four classes: 1. Those approved by the corporation, which the corporation was prepared to finance on its own credit without calling upon the Railroad Administration in any way. 2. Items which the corporation approves, but not being able to finance on its own credit was prepared to furnish security by means of which the director of finance would be able to assist in securing funds. 3. Projects approved by the corporation, but which it could not finance and for which it was not prepared to furnish security to the director of finance and for which, therefore, it must call upon the Railroad Administration to furnish all the funds on the notes of the corporation without security: 4. Projects disapproved by the corporation. Information as to the status of each improvement in these classes was to be furnished to the Division of Capital Expenditures.

D. C. E. Circular No. 20 directed that each federal manager be instructed to afford the proper corporate officer upon application full authority to review projects chargeable to capital account, whether in progress or contemplated, including not only the items in the 1919 budget and on D. C. E. forms approved since January 1, 1919, but also all uncompleted items in the carry-over from 1918. If the corporate officer withdraws or withholds approval of any project for financial reasons or otherwise, the instructions are as follows:

"1. Work not started shall not be commenced without further approval by this division.

"2. As to projects already started and actually under way, please see that no further work is done, except:

"(a) When necessary to insure safety.

"(b) Where the project is so far completed that to stop work would be more expensive than to continue it.

"(c) Where a job is covered by bona fide contract and stopping the work would seriously demoralize conditions, especially as to working forces.

"In all cases where the federal manager and the regional director believe the work should be done, whether as to new work or as to continuing work now in progress, even though the railroad company withholds or withdraws its approval, a full report should be made promptly to the Division of Capital Expenditures (with a copy thereof to the president of the company) stating the objections or disagreements that cannot be overcome, with a definite recommendation of the Federal Manager and Regional Director; and, pending further approval by this division, no such work should be started and, except as provided in Section 2 above, no such work in progress should be carried on."

It was estimated that improvement work amounting to approximately $300,000,000, exclusive of equipment, was in progress at the time this circular was issued. On January 1, there was still to be expended on the 1918 budget $307,000,000 for additions and betterments, $30,000,000 for extensions and $368,000,000 for equipment, but all of these items were made subject to review and new authority both from the Division of Capital Expenditures and from the corporations as a part of the 1919 budget. Most of the equipment was represented by the cars and locomotives ordered last year or by the railroad companies in 1917. In addition, the federal managers had submitted additional budgets for 1919 amounting to approximately $325,000,000, but the items included are still subject to the approval of the corporations as outlined in D. C. E. Circular No. 19.

The Railroad Administration, on March 18, arranged for a loan of $50,000,000 from the War Finance Corporation to be used to replenish the working capital in the hands of the federal treasurers to meet current requirements, one of the large items being cross ties which have been deliverd in large quantities and which are to be paid for on receipt.

In an address before the Pittsburgh Traffic Club a few days ago, Director General Hines referred to the new conditions created by the failure to pass a revolving fund appropriation and its effect on improvement programs as follows:

"Unfortunately, the impression has gone out that the Railroad Administration has decided to cut off all improvement work, including additions and betterments and maintenance. This is not a fact. What has happened is that we are taking steps to give the railroad corporations full opportunity to determine whether they should assent to the work which they must finance. It is the intention of the Railroad Administration to carry forward just as much work as possible in order that labor may not be thrown out of employment unnecessarily and in order that the railroads will be kept in good repair and extended to meet the needs of the situation."

ORDERS OF THE REGIONAL DIRECTORS

Order No. 188 of the Southwestern region issued under date of March 27 instructs that coal should not be stored on the ground within 200 ft. of any well or other source of water supply for engine, boiler or drinking purposes in order to avoid the danger of contaminating the water by sulphur or other elements which drain or seep from the storage piles.

The regional director of the Eastern region has called attention to the fact that the requirements of several roads for new ties for 1919 as received at Washington indicate renewal programs far in excess of the average renewals during the present year. This is presumably because of the necessity of restoring the normal stocks on hand. Roadmasters and supervisors are cautioned to make personal inspections of the track to see that no ties are replaced which can be carried over another year, while still keeping the track in safe condition.

The regional director of the Eastern region has prescribed for accounting purposes prices for different qualities of second-hand rail which may be carried in stock to avoid the difficulty of following the fluctuation in market prices. Except where there is some serious objection to the contrary, new rail is to be charged at the invoice price at which purchased and stock is to be calculated at the average price paid for such rail on hand or being purchased. Second-hand rail for stock purposes is to be valued as follows:

Relayer	$28.00
Sidings and yards	25.00
Scrap	14.00

When material of this kind is to be sold, the sale is to be made at the highest price obtainable.

RENTAL CHARGES FOR CONSTRUCTION EQUIPMENT

The director general has approved the following as rental charges to be applied between railroads for construction equipment, effective as of March 1:

	Rate per Day
Locomotive Cranes:	
Five tons capacity or less	$15.00
Over 5 tons capacity and less than 20 tons capacity	20.00
Over 20 tons capacity	25.00
Wrecking Cranes:	
Steam wrecking cranes, 75 tons capacity and less	40.00
Steam wrecking cranes, capacity more than 75 tons	55.00
Lidgerwood Unloaders:	
Without cable and plow	7.00
Including cable and plow	10.00
Ditching machine	10.00
Pile Drivers:	
Drop hammer	10.00
Steam driver	15.00
Self-propelled steam driver	22.50
Steam Shovels:	
With dipper less than 2½ cu. yds. capacity	15.00
With dipper 2½ cu. yds, capacity or greater	20.00
Other Work Equipment:	
Self-cleaning ballast cars	1.50
Equipment or tool cars	1.50
Tank or water cars	1.50
Boarding, bunk, commissary, or camp cars	1.50

(Provided that in no case shall the rates for "Other Work Equipment" be less than the per diem rates.)

Note.—When necessary to haul Other Work Equipment over road owning it for delivery to borrowing road, or intermediate carrier, the rate of 3½c per mile will apply; with locomotives, Lidgerwood unloaders, pile drivers, steam shovels, unless otherwise provided by special arrangement, tariff rates will apply.

INDUSTRY TRACKS

In Circular No. 185 the regional director of the Southwestern region has presented at some length the requirements governing the construction and operation of industry tracks. This circular is in part as follows:

1. New Industry Tracks: (a) The industry shall pay for, own and maintain that part of the track beyond the right of way of the railroad. (b) The railroad shall pay for, own and maintain that part of the track on the right of way from the switch-point to the clearance point.

The above paragraph (b) or any paragraph herein contained is not to be construed as requiring or authorizing a federal manager to enter into a contract on behalf of the director general to pay for that part of an industry track on the right of way from the switch point to the clearance point where, in the judgment of the federal manager, the amount of traffic to be derived by the United States Railroad Administration from the construction of the industry track is not sufficient to justify such expenditure.

In cases where, in the judgment of the federal manager, the circumstances justify the construction of an industry track, but the amount of revenue to be derived therefrom by the United States Railroad Administration does not justify the payment by the director general of the cost of that part of the track on the right of way from the switch point to the clearance point, an agreement may be made, but providing for the payment of the entire cost of the track by the shipper, with a provision for refund up to, but not exceeding, the cost of that part of the track from the switch point to the clearance point, at the rate of $2 per car of carload freight yielding road haul revenue, delivered on or shipped from the track during federal control.

It is considered reasonable to enter into a contract whereby the railroad will pay at the outset for the cost of that part of the track between the switch point and the clearance point when the federal manager believes that for the first two years following completion of the track the average monthly gross revenue accruing to all railroads under federal control on business to and from the industry will be equal to 15 per cent of the building cost assumed by the director general.

(c) Generally speaking, the industry shall pay for and maintain (although in special cases the railroad may do so), and the industry shall own, that part of the track located on the right of way of the railroad from the clearance point of the turnout of the right of way line and for which track it paid, except where contract or agreement has already been made which places the ownership of that portion of the track in the railroad, which contracts or agreements shall stand as made.

Upon discontinuance of the use of the track for purposes of the industry, it shall possess the right to have the track materials on the right of way, which were paid for by the industry during federal control, taken up and delivered to the industry, except to the extent that the cost of such track materials shall have been refunded to the industry by the railroad or the director-general. The work of taking up the track shall be done, if the federal manager shall so desire, by the railroad forces, but in any event, at the expense of the industry.

(d) If the industry fails to maintain in reasonably safe condition that part of the track which it is required to maintain, the railroad may disconnect the track or refuse to operate over it, when not in such condition.

A track or portion of a track on railroad right of way used wholly or partly for the purpose of loading freight to and from cars, to and from an industry, and not in use at the same point as a public delivery track, is to be regarded as an industry track and the cost of maintenance thereof shall be borne by the industry, except that where the track, or a portion thereof, so used by the industry, is also used for passing cars to and from other industries or other tracks of the carrier, the expense of maintenance should be apportioned between the carrier and the industry or industries affected, in proportion to the amount of use of the track for the industry and the passage of cars for other purposes.

(e) The railroad shall have the right to use the track when not to the detriment of the industry.

2. When existing industry tracks are not covered by a written contract, they shall be maintained and operated in accordance with the above stated provisions, covering maintenance of new industry tracks.

MAINTAINING THE GUARD RAIL GAGE

By W. F. RENCH

SUPERVISORS who come into daily contact with detailed track conditions know that one of the features receiving the least intelligent treatment is the guard rail. A surprisingly large percentage of track foremen do not know the true definition of the guard-rail gage by which alone the guard rail should be placed and maintained. To many of them it is merely an opening, generally 1¾ in. or 2 in., between the main and the guard rails. It is not even clearly understood that the opening varies with the track gage employed. The guard rail gage is the distance from the main rail of the frog to the flange side of the guard rail, and is always 4 ft. 6¾ in., whatever may be the gage of the track. It is measured at the gage line, which is ⅝ in. below the top of rail. The dimension is determined by the fact that the greatest distance permitted between the gage line of one wheel and the back of the other by the M. C. B. rule for wheels cast prior to 1908, is 4 ft. 6¾ in. Practically all frogs have flangeways of 1¾ in., and the effective opening for the passage of wheels is thus 4 ft. 5 in. This is just within the limit set by the newer M. C. B. standard for the least distance between the back gage line and the back of wheels or 4 ft. 5 3/32 in. The greatest distance between gage line and back of wheel for those cast under the newer rule is 4 ft. 6 29/64 in. It is thus assured that in no case will the wheels strike the point of frog with the guard rails properly placed and maintained.

The importance of establishing the guard-rail gage correctly will be shown by an imaginary case. It is customary to employ a wider track gage for the sharper turnouts, the standards of one road requiring 4 ft. 9 in. to be used in a No. 6 turnout. With such gage the proper opening between the main and guard rail is 2¼ in. If through error the opening were made 1¾ in., the same as for 4 ft. 8½ in. gage, there would result an opening between the wing of the frog and the guard rail of 4 ft. 5½ in., which clearly would be too great to allow the passage of even the widest gage of wheels, unless one of three things occurred, (1) the mounting of the guard

rail by the flanges, (2) a drawing inward of the frog or the main and guard rails, these being rigidly connected by clamps, or (3) the tearing out of the guard rail. It is a matter of experience that all of these do occur, with inexcusable charges for repairs or actual derailments, with the possibility of serious consequences. The reverse condition of a diminished guard-rail gage leads to the stage wherein the point of the frog is rubbed by the wheels, and in extreme case may be mounted.

Since it is manifestly impossible to maintain exact gage, it is permissible to suggest a working margin of safety, and this is 1/8 in. either way from the ideal dimension. Some types of fillers do not allow the adjustment of the guard rail closer than 3/16 in. It is preferable in setting the guard rail to exceed the gage by half this amount rather than to reduce it. The guard rail gage will not increase, but will tend to diminish through the wear of the guard rail and through the tightening of the track gage by reason of the unequal creeping of the rails. The slightly increased dimension will still permit the passage of wheels of minimum gage between backs. Because there are probably few wheels remaining in use which were cast prior to the adoption of the 1908 specifications, and as these are unquestionably somewhat worn, it would seem that a slackening of the guard-rail gage 1/8 in. should not be regarded as unfavorable. An increase in the guard-rail gage above 4 ft. 6 7/8 in. or a reduction below 4 ft. 6 5/8 in. is an error which requires prompt correction.

The existence of a wide guard-rail gage may be detected by the marks of wheels riding the edge of the guard-rail, by the frog becoming loose in the spikes, or by a similar condition of the main and guard rails. A diminishing guard-rail gage may be observed by wear appearing along the sides of the point. It is, of course, a duty to discover such defects by frequent test with the rule or the gage before they attain to a degree, causing damage to the members of the connection. It is suggested that the best means to attain and preserve the correctness of the guard-rail gage is to insist rigidly upon the use of a properly designed and fabricated tool for the placing of the member and to prohibit entirely the placing of the guard rail by measuring an opening along the main rail. If the practice is followed by having all gages sent periodically for testing to the roadmaster's or supervisor's headquarters where equal attention will be given to the guard rail feature as well as the track gage, assurance will be had that error is not fostered by the use of incorrect gages.

FAST WORK AT TRACK LAYING*

THE "STARS AND STRIPES," the official newspaper of the American Expeditionary Forces, published in France, in a recent issue devotes much space to the contests in laying narrow gage track, 60 c. m. (2 ft.), which had been shipped overseas unassembled to save shipping space. Remarkable results in length of track laid per day were obtained by these contests. Teams were composed of 12 men each, working in pairs. Six men bolted the ties to the rails, while the other six men, acting as helpers, supplied the necessary ties, splice bars, clips and bolts as fast as needed.

One contest started by two rival teams began at 7 o'clock in the morning and ran all day without let-up, in spite of raw winds and drizzling rains. One of the teams had not tasted defeat in track laying since it arrived in France 15 months earlier. But it had a strong rival this day.

"With the first defeat seemingly inevitable they became desperate. As the time for the finish grew shorter the two teams were neck and neck, but at the close they were the winners in a grand stand finish.

They had laid 280 sections, or about 4,572 ft. of track, while their rivals were a close second with 279 sections, losing just by one section, or approximately 16.13 ft. Officers had promised a feast for the winners, but the race was so close both teams were invited to the celebration that night in the mess hall.

*Abstracted from an article in "The Road to Peace," recently issued by the Lakewood Engineering Company, Cleveland, Ohio.

MATERIAL MARKET

PRICES FOR IRON AND STEEL commodities, including rails, were placed on a new basis on March 25 when the conference of the Industries Board of the Department of Commerce and a special committee of manufacturers agreed to a schedule involving important reductions in prices. On this standard Bessemer rails have been placed at $45 and open hearth rails at $47 per gross ton, a reduction of $10 per ton from the prices prevailing for several months previous. The new quotations apply to all purchases by the various government departments and are effective at once. The board states that the public should not expect to buy during the current year at any lower rates. It had been hoped when the price conference was initiated, that extensive purchases by the Government would result, but the failure of the Railroad Administration's financing program has interfered seriously with such plans. However, there is still talk of an order for 500,000 tons of rails. Items in the new schedule of interest to maintenance men are given below:

	Nov. 11 Price	Present Price	New Price
Sheared plates	$ 3.25 cwt.	$ 3.00	$ 2.65
Structural, base	3.00 cwt.	2.80	2.45
Plain wire	3.25 cwt.	3.25	3.00
Nails	3.50 cwt.	3.50	3.25
Rails, Bessemer	55.00 G.T.	55.00 G.T.	45.00 G.T.
Rails, O. H.	57.00 G.T.	57.00 G.T.	47.00 G.T.

New prices for track materials other than rails which were established a few days later are given below, these quotations being "Pittsburgh base" except that for steel tie plates and angle bars, which applies also to Chicago:

	Old Price	New Price
Track spikes	$3.65	$3.35
Track bolts	4.65	4.35
Steel tie plates and angle bars	3.00	2.75

Cast iron pipe has also suffered another reduction of $5 per ton, the new figure being $56.80 for 6-in. pipe or larger. The warehouse prices have also been cut so that the warehouse figure for steel plates is 3.67 cents at Chicago and New York and that for steel shapes is 3.47 cents. Scrap prices seem to be tending upward except that the new prices for new rails naturally cause a reduction in the value of relaying rails as indicated by the following table:

	Prices per Gross Ton	
	Chicago	St. Louis
Rails relaying	$45.00 to $50.00	$40.00 to $45.00
Rails rerolling	16.50 to 17.00	16.00 to 17.00
Rails less than 3 ft. long	17.00 to 17.50	16.50 to 17.00
Frog and switches cut apart	15.50 to 16.00	15.00 to 15.50

The Department of Commerce is now at work with representatives of the building material manufacturers and it is anticipated that new price schedules on lumber, brick, stone, etc., will soon be promulgated. Pending the conclusion of negotiations quotations on lumber have not reduced appreciably.

According to latest reports Director-General Hines is not entirely satisfied with the reduction in the price of rails and there is danger that the entire price reduction program will fail.

GENERAL NEWS DEPARTMENT

A fire at the Inman yard of the Southern Railway, near Atlanta, Ga., on the night of March 16 destroyed 80 loaded cars, 20 empty cars, the freight transfer shed, and other property; estimated loss, $1,500,000.

The Fourteenth Engineers, a railroad regiment composed of men from the Boston & Maine, the Boston & Albany, and the New York, New Haven & Hartford, was expected to reach home from France about April 1.

Three hundred men, employed on second track work for the Cleveland, Cincinnati, Chicago & St. Louis, near Winchester, Ind., where dismissed by the contractors on March 13, for the reason, it is said, that the Railroad Administration has held up the appropriation for the work.

The bill validating Informal War Contracts, many of which were held by companies engaged in the railway supply field, which has been pending before Congress for several weeks, was signed by the President on March 2.

Uniform rules for working conditions were the subject of a meeting held in Washington, commencing on March 10, between two representatives of each regional district and an equal number of representatives of the Brotherhood of Maintenance of Way Employees and Shopmen. A tentative draft of such rules was submitted to the board by the brotherhood some time ago.

A total of 119 railroads out of a list of 184 Class 1 roads under federal control earned less than the amount of their standard return during the calendar year of 1918, while 65 roads earned net operating incomes greater than their standard return and so contributed some $18,000,000 towards making up the deficiency in meeting the standard return on the other roads. The net deficiency for all Class 1 roads was $202,135,602, while the total standard return which the government is obligated to pay the roads for the year is $890,335,685.

The number of employees on the railroads in January, 1919, was 8.2 per cent greater than in December, 1917. This figure was given out by Director-General Hines in a recent statement in which he defended the Railroad Administration in a reply to a statement by Howard Elliott, president of the Northern Pacific, that the Pennsylvania Railroad system had nearly 40,000, or 16⅔ per cent, more employees on December 31, 1918, under federal control, than it had on December 31, 1917, under private control. Mr. Hines contended that better weather during December, 1918, permitted much more work to be done during that month than in the month of the year previous and that furthermore the conditions on the Pennsylvania are not typical of those for the entire country.

Accident Bulletin No. 66, issued by the Interstate Commerce Commission, gives the statistics for railway accidents during the year ending December 31, 1917. These show that the total number of persons killed on American railroads was 10,087, while the number injured was 194,805. Of this number, the casualties to passengers included 343 killed and 8,374 injured and those to employees on duty included 2,959 killed and 60,610 injured. Casualties to trespassers not involved in train accidents included 4,175 killed and 3,753 injured. Train accidents recorded during 1917 totaled 19,435 items involving a property loss of $15,181,810, resulting in the death of 691 persons and injuries to 9,222. Of these totals defects in roadway caused 2,072 accidents, at a cost of $1,727,230, 31 lives and 1,067 personal injuries, while accidental obstructions were responsible for 332 accidents, with damage to property aggregating $535,710 and 51 deaths and 346 injuries. The grade crossing accidents recorderd numbered 131, with a property damage of $40,300, the death of 101 persons and injury of 351.

Correction.—Owing to an error in the article entitled "Standard Specifications for Timber Preservation," published on page 95 of the March issue, the process entitled For Treatment with Creosote Oil by the Empty Cell Process, with Final Vacuum, was designated as the Rueping process. This should have been the Lowry process. On the following page the process for Treatment with Creosote Oil by the Empty Cell Process with Initial Air Pressure and Final Vacuum, should have been designated as the Rueping instead of the Lowry process.

The Great Northern has recently created from one to six positions in the track department on each division, to be known as "assistant to roadmasters." These positions are to be filled with graduates of engineering schools and with promising young men of track experience, in this way creating competition between the two classes of men and providing opportunity for both. The men in these positions will be given a training in maintenance of way accounting in addition to their general work in the field. The idea is to introduce, at the bottom, men who by reason of education or experience offer suitable material for training and development for higher positions, such as division engineers, division superintendents, etc. A regular line of promotion has been scheduled, although the rapidity with which a man attains recognition will depend upon the time required for him to qualify himself for larger responsibilities. By providing a definite line of promotion for young men in this branch in the maintenance of way department it is hoped to raise the standards of work and to offer opportunities for promising young men to develop in the railway business.

TIE PRODUCERS CONSIDER SITUATION

A meeting of the regional vice-presidents comprising the board of directors of the National Association of Tie Producers met at the Planters Hotel on March 24, to receive reports from the different tie producing regions and to consider conditions confronting the industry. The financial problems now confronting the Railroad Administration, owing to the failure of Congress to pass the revolving fund appropriation before adjournment, is already having its effect upon tie production, as some roads have ceased their prompt payment for cross ties delivered while others are seemingly adopting a policy of forcing loans from the larger tie producers by withholding payment to them in preference to those producers who are less able to carry the account. The tie manufacturers feel that this is not consistent with the Railroad Administration's declaration, made earlier in the year, that there would be no difference in the treatment of the large and small producers. The larger producers are willing to co-operate with the roads in tiding them over their present financial embarrassment providing the Administration recognizes this and other functions of the tie contractors in the production of cross ties to which attention has been called in the past and which it is felt that the Administration has not given sufficient attention in recent months.

Considerable interest was expressed in the outlook for an export demand for cross ties. Some of the producers showed much concern about the inquiry, which is now out for 10,000,000 cross ties for British and French railroads. One member of the board of directors of the Tie Producers' Association has also received an inquiry for 2,000,000 ties for export to Italy.

A resolution was adopted by the board of directors authorizing the president of the Association to appoint a committee to confer with the officers of the Railroad Administration at Washington in regard to the conditions which now exist in the tie industry and to endeavor to secure certain changes in the present practices which are believed to be important to the railroads as well as to the producers.

PERSONAL MENTION

GENERAL

A. L. Morgan has been appointed chief engineer of the Des Moines Union, the Iowa Transfer, the Des Moines Western and the Des Moines Terminal, with headquarters at Des Moines, Iowa.

Harry J. Sargent, formerly valuation engineer and later assistant to the chief engineer of the Boston & Maine, with office at Boston, Mass., under federal management, has been appointed corporate engineer.

Lieutenant William H. Hobbs, 332nd Field Artillery, U. S. A., who has returned from France and received his discharge from the army, resumed his position as assistant engineer on the Louisiana division of the Missouri Pacific, with headquarters at Monroe, La., on March 1.

W. H. Vance, engineer maintenance of way of the St. Louis-Southwestern and the Louisiana & Arkansas, has been appointed engineer maintenance of way of the St. Louis-Southwestern lines, including the St. Louis-Southwestern of Texas, the Eastern Texas, the Dallas Terminal & Union Depot, and the Southern Illinois & Missouri Bridge, with headquarters at Tyler, Texas.

H. H. Johntz, division engineer on the Missouri, Kansas & Texas, at Parsons, Kan., has been appointed engineer maintenance of way on the Missouri, Kansas & Texas and the Oklahoma Belt, with the same headquarters in connection with a recent rearrangement of lines. **A. E. Triplett,** district engineer on the Missouri, Kansas & Texas of Texas, with headquarters at Dallas, Texas, has been appointed engineer maintenance of way of the Missouri, Kansas & Texas of Texas and the Wichita Falls & Northwestern, with headquarters at Dallas, Tex.

A. A. Schenck, engineer of maintenance on the Chicago & North Western, with headquarters at Omaha, Neb., has been appointed assistant to the chief engineer with jurisdiction over lines west of the Missouri River, with the same headquarters. **A. K. Gault** has been appointed division engineer of the Eastern division of the Chicago & North Western and the Missouri Valley & Blair Bridge & Railroad, with headquarters at Omaha. **W. T. Main** has been appointed division engineer of the Black Hills division of the Chicago & North Western and the Wyoming & North Western Railroad, with office at Chadron, Neb.

C. F. Urbutt has been appointed district engineer on the Chicago, Milwaukee & St. Paul, with headquarters at Chicago, succeeding **W. L. Webb,** who has been assigned to special duty in connection with the new Chicago union station project. Mr. Urbutt formerly held the positions of assistant engineer and engineer of track elevation on that road with the same headquarters. During the summer of 1917 he entered military service, later receiving a commission as lieutenant and being assigned to duty with the construction quartermaster's forces. Following the cessation of hostilities he returned to civil life and was assigned to special duties in the engineering department of the Chicago, Milwaukee & St. Paul, with which he was occupied until his recent appointment became effective.

William S. Wilson, who has been appointed division engineer on the Pennsylvania Railroad, with office at Oil City, Pa., as has already been announced in these columns, was born on March 12, 1880, at Philadelphia, Pa., and graduated from the Central Manual Training School, Philadelphia, in June, 1899. The following August he began railway work in the construction department of the Pennsylvania Railroad, and in 1900 was transferred to the office of the engineer maintenance of way at Philadelphia. In November, 1902, he was promoted to assistant supervisor on the Trenton division, and later was transferred to the Pittsburgh division. He subsequently served as supervisor consecutively on the Bellwood, the Erie, and the Pittsburgh divisions until his promotion on February 1, 1919, to division engineer of the Allegheny division, with headquarters at Oil City, Pa., as above noted.

Orlando H. Frick, field engineer in valuation work on the Chicago, Milwaukee & St. Paul, has been promoted to district engineer on that road, with headquarters at Milwaukee, Wis. He was born at Manitowoc, Wis., on September 25, 1879, and graduated from the University of Wisconsin in 1902. He started his railway career the same year as a levelman with the Louisville & Nashville. A short time later he took a position with the Chicago, Rock Island & Pacific as assistant engineer, and early in 1904 became resident engineer on the Missouri, Oklahoma & Gulf, in which position he remained until September, 1904. The following two months he served as resident engineer on the Appalachicola Northern and he then entered the service of the Chicago, Milwaukee & St. Paul, with which company he has since remained, serving 10 years as assistant engineer and later as pilot engineer and field engineer on valuation work until his recent appointment to the position of district engineer.

A. V. Redmond, division engineer of the Canadian Government railways, with headquarters at Cochrane, Ont., who has been promoted to district engineer on the Canadian National railways, with headquarters at Winnipeg, Man., was born at Kingston, Ont., on May 16, 1879. Mr. Redmond graduated from Queens University in 1903, and entered railway service with the Grand Trunk Pacific in January, 1904, as a levelman. In August, 1905, he was made transitman and acting engineer in charge of location on the National Trans-Continental, and from January, 1908, to October of that year was engineer in charge of location and construction for the Canyon City Water Supply at Canyon City, Colo. In October, 1908, he was appointed resident engineer on construction for the National Trans-Continental and one year later became division engineer on the same road. In June, 1916, he left that road and entered the employ of the Canadian Government railway as resident engineer and acting division engineer and in June, 1917, he was promoted to division engineer, which position he held at the time of his recent appointment.

Louis Warren Duffee, who has been appointed chief engineer of the Gulf, Mobile & Northern, with headquarters at Laurel, Miss., was born in 1884 at Mobile, Ala., and was educated in the Alabama Polytechnic Institute. He began railway work in August, 1904, with the Bay Minette & Fort Morgan Railroad. The following year he was appointed an assistant division engineer on the Louisville & Nashville, and then after three years of varied engineering work in Alabama and Indian Territory he entered the service of the Mobile, Jackson & Kansas City, now part of the Gulf, Mobile & Northern, as resident engineer on maintenance and construction. In 1911 he was appointed locating engineer on the same road, which then became the New Orleans, Mobile & Chicago. Mr. Duffee was engaged in conducting new surveys and carrying out some construction work until 1917, excepting about two years in 1912 and 1913, when he was chief engineer of the Meridian & Memphis. In 1917 he was appointed special engineer of the Gulf, Mobile & Northern and had charge of federal valuation work and special engineering projects on that road. On December 1, 1918, he was made acting chief engineer, which position he held until his recent appointment as chief engineer of the same road, as above noted.

E. L. Martin, engineer of maintenance of way of the Missouri, Kansas & Texas, at Parsons, Kan., has been appointed chief engineer of the Missouri, Kansas & Texas, the Oklahoma Belt and the Missouri, Oklahoma & Gulf. He graduated from the Agricultural and Mechanical College of Texas in June, 1899, and began his railway career as an axman on location work with the Texas & New Orleans. In September, 1899, he went to the Southern Pacific and served in various capacities in the engineering department until he became assistant engineer. In 1902 he was appointed assistant engineer on the Kansas City Southern, at Pittsburg,

Kan., and left that position in 1905 to become division engineer and assistant engineer on construction for the Gulf, Colorado & Santa Fe, in Texas. In 1912 he was appointed assistant superintendent of the Southern Pacific at Lafayette, La., and the following year was made division engineer on the Missouri, Kansas & Texas, at Denison, Texas. Later he was appointed engineer of the Missouri, Kansas & Texas in charge of the construction of the San Antonio terminals, which position he held until his appointment as engineer of maintenance of way for the same road in April, 1917. As chief engineer of the Missouri, Kansas & Texas, the Wichita Falls & Northwestern and the Missouri, Oklahoma & Gulf, with headquarters at Dallas, Tex., Mr. Martin succeeds **F. G. Jonah,** chief engineer of the Missouri, Kansas & Texas and the Missouri, Oklahoma & Gulf, and **F. Merritt,** chief engineer of the Missouri, Kansas & Texas Railway of Texas and the Wichita Falls & Northwestern, both of whom were assigned to other lines in connection with the recent regrouping of roads in the Southwestern Region.

James H. Knowles, whose appointment as chief engineer in charge of construction and maintenance of way and structures of the Western Pacific, the Tidewater Southern and the Deep Creek was announced in the *Railway Maintenance Engineer* for March (page 111), was born at Chicago, Ill., on December 15, 1876, and graduated from the University of Wisconsin in 1899. He entered railway service in January, 1901, with the Oregon Short Line as a structural draftsman and in 1903 he was appointed assistant division engineer on the San Pedro, Los Angeles & Salt Lake, with headquarters at Salt Lake City, Utah, which position he held for seven years. From 1910 to 1912 he was division engineer on the Western Pacific, with headquarters at Elko, Nev., and the following six years served in the capacity of bridge engineer of that road at San Francisco, which position he held until his promotion to chief engineer, as noted above.

James H. Knowles

E. Bruce Ford, assistant engineer of maintenance and construction on the Great Northern, has been appointed assistant engineer in the Northwestern Region, with office at Seattle, Wash., succeeding **T. G. Hastie,** who resigned to return to his previous position as resident engineer on the Great Northern at Great Falls, Mont. Mr. Ford was born at Laceyville, Pa., on August 21, 1881, and received his education in the high school of that place and the State Normal School at Mansfield, Pa., later attending Lafayette College. He began railway work in July, 1902, as a tapeman and rodman on the Delaware, Lackawanna & Western, and one year later he entered the employ of the Pittsburgh, Shawmut & Northern and the Buffalo & Susquehanna as a draftsman. In 1905 he became a draftsman and masonry designer with the Syracuse Railroad Construction Company, at Syracuse, N. Y., and in 1906 was appointed assistant division engineer on the Cleveland, Cincinnati, Chicago & St. Louis, with headquarters at Middletown, Ohio. The following year he was employed on the Chicago, Milwaukee & Puget Sound as a resident engineer, and in 1909 he went with the Grand Trunk Pacific as a construction foreman. From 1910 to March 1, 1919, he served consecutively on the Great Northern as draftsman and assistant engineer, on the Marcus division; assistant engineer at Vancouver, B. C., on terminal developments at that place, and office engineer in the principal assistant engineer's office at Seattle, Wash., which latter position he held at the time of his appointment as assistant engineer of the Northwestern Region.

Robert H. Ford, engineer of track elevation on the Chicago, Rock Island & Pacific, has been promoted to principal assistant engineer, with headquarters at Chicago. He is a graduate of Norwich University, Northfield, Vt. He began his railroad career with the Central Vermont, with which road he was engaged in various roadway, engineering and construction capacities. In 1906 he went with the Missouri Pacific as maintenance of way inspector and the following year he was appointed principal assistant engineer of the system. In 1910 he resigned from that position to become chief engineer of the Hodges-Downey Construction Company, general railway contractors, in which capacity he served for two years. He then entered the employ of the Chicago, Rock Island & Pacific as special engineer. Previous to his recent appointment as principal assistant engineer he was engineer of track elevation in charge of general construction and special work, principally in the Chicago district.

Robert H. Ford

TRACK

B. F. McGuire, supervisor of track on the Lehigh Valley, with headquarters at Delano, Pa., has been transferred to Rochester Junction, N. Y., in place of **W. F. Nichols,** who has been transferred to Buffalo, N. Y., succeeding **M. J. Greeney,** deceased.

J. Bolan has been appointed roadmaster on the Northern Iowa division of the Chicago & North Western, with headquarters at Eagle Grove, succeeding **W. J. McDermott,** who has retired from active service after a period of 36 years in the employment of this road.

Ray Hurlbut, who has been appointed roadmaster on the Chicago, Burlington & Quincy, with headquarters at Osmond, Neb., was born at Red Oak, Iowa, on April 1, 1883, and entered railway service with the Chicago, Burlington & Quincy in April, 1906, as a track laborer. In August, 1908, he was made foreman, with headquarters at Oreapolis, Neb., and three years later was transferred to Havelock, Neb. In July, 1912, Mr. Hurlbut was promoted to extra gang foreman and in November, 1912, he was transferred to the Omaha yard. In February, 1917, he was made general foreman of the Omaha terminals, which position he held until his recent appointment to the position of roadmaster, as noted above.

Orbin P. Quillen has been appointed roadmaster on the El Paso division of the Chicago, Rock Island & Pacific, with headquarters at Liberal, Kan., succeeding **J. T. Ready,** resigned. He was born at Coatesville, Ind., on June 25, 1875, was educated in the public schools and on September 10, 1889, entered railway service as a section laborer with the Atchison, Topeka & Santa Fe. In April, 1895, he was promoted to section foreman, later filling positions as extra gang foreman and yard foreman on maintenance and construction work up to October, 1906. Mr. Quillen then entered the service of the Union Pacific, being engaged on construction projects until October, 1911, when he entered the employ of the Kansas City Terminal at Kansas City, Mo., building the first permanent track into the new Union depot at that place. Later he was appointed superintendent of the Kansas City Rock & Sand Company at Kansas City, and in

November, 1913, he entered the service of the Chicago, Rock Island & Pacific, with which road he has been since employed and during which time he has served as roadmaster on the south end of the Kansas City division for more than three years. He has now been made roadmaster of the El Paso division, as noted above.

P. H. Brennan has been appointed roadmaster on the Sterling division of the Chicago, Burlington & Quincy, covering the lines from Alliance, Neb., to Bridgeport and from Northport, Neb., to Guernsey, Wyo., with headquarters at Bridgeport, succeeding **H. L. Stein,** who has been transferred to the Wymore division in charge of the lines from Crete, Neb., to Wymore, from Odell, Neb., to Concordia, Kan., and from Fairmont, Neb., to K. C. & O. Jct., with headquarters at Wymore, Neb. Mr. Stein succeeds **J. M. Workman,** who has been appointed trainmaster and roadmaster on the McCook division for the lines between Orleans, Neb., and St. Francis, Kan., and from Republican, Neb., to Oberlin, Kan., with headquarters at Orleans, in place of **C. Starks. Ray Hurlbut** has been appointed roadmaster on the Omaha division for the lines from Sioux City, Iowa, to O'Neill, Neb., with headquarters at Osmond, Neb., succeeding **J. Kern. S. H. Weckworth** has been appointed assistant roadmaster on the Casper division in charge of the lines from Fromberg, Mont., to Kirby, Wyo., and from Frannie, Wyo., to Cody with headquarters at Greybull. Mr. Brennan was born at Tecumseh, Neb., on February 22, 1871, and was educated in the public schools of that city. On March 28, 1895, he entered railway service with the Chicago, Burlington & Quincy as a section laborer and in August, 1896, he was appointed section foreman. In October, 1902, he was promoted to extra gang foreman and in April, 1906, he was again promoted to roadmaster. In September of that year he became trainmaster and roadmaster, which position he held until April, 1918, when he left the service temporarily. Upon his return the first of this year he resumed his duties as roadmaster, as noted above.

BRIDGE

Captain L. C. Dodge, Engineers, U. S. A., with headquarters in the office of the director-general of military railways at Washington, D. C., has received his honorable discharge from the army and has been appointed assistant engineer of bridges of the Baltimore & Ohio, Western Lines, with office at Cincinnati, Ohio.

Ben L. Rhodes, who has been appointed supervisor of bridges and buildings on the Mobile division of the Southern Railway, with headquarters at Selma, Ala., as noted in last month's issue, was born on August 14, 1881, at Montevallo, Ala., and was educated in the public schools. He entered railway service with the Southern on September 1, 1898, with the carpenter and bridge force and on July 28, 1903, he was promoted to bridge foreman, which position he held until his recent appointment.

PURCHASING AND STORES

A. E. Cox, general storekeeper of the Canadian Northern, Western Lines, has been appointed general storekeeper of the Canadian National, Western Lines, with headquarters at Winnipeg, Man.

J. E. Anderson, purchasing agent of the Ft. Worth & Denver City; the Ft. Worth & Rio Grande; the Gulf, Colorado & Santa Fe; the International & Great Northern; the Missouri, Kansas & Texas; the Missouri, Kansas & Texas of Texas, and the Texas Midland, with office at Dallas, Texas, has been appointed assistant purchasing agent of the St. Louis-San Francisco; the Kansas City, Clinton & Springfield; the Paris & Great Northern; the West Tulsa Belt, and the Rock Island-Frisco Terminal, with headquarters at St. Louis, Mo.

J. M. Velasco, local purchasing agent of the National Railways of Mexico, at New York, has been appointed assistant to the general purchasing agent, with office at Mexico City, Mex., and **F. P. de Hoyos,** general agent of the traffic department, at New York, is now also local purchasing agent, with office at New York.

REORGANIZATION OF THE DIVISION OF PURCHASES, UNITED STATES RAILROAD ADMINISTRATION

Effective March 15, John Skelton Williams, director of the Division of Finances and Purchases of the Railroad Administration, resigned and the division was divided into two parts, the Division of Finances and the Division of Purchases. Henry B. Spencer, who has been director of the Central Advisory Purchasing Committee, has been appointed director of the new Division of Purchases, and Samuel Porcher and George G. Yeomans, associate members of the Central Advisory Committee on Purchases, have been appointed assistant directors of the Division of Purchases. William W. Morris, secretary of the committee, has been appointed assistant to the director. A new Advisory Committee on Purchases has been organized, consisting of Mr. Williams and Robert S. Lovett, formerly director of the Division of Capital Expenditures, and Henry Walters, who has served as a special adviser to the Director-General of Railroads. The four special branches of the old purchasing section, which formerly reported to the Central Advisory Purchasing Committee, now will report direct to the director of the Division of Purchases. These divisions include the Forest Products section, M. E. Towner, manager; the Procurement section, H. C. Pearce, manager; the Stores section, E. J. Roth, manager, and the Fuel Conservation section, headed by B. P. Phillippe.

George W. Snyder, assistant engineer, maintenance of way, in charge of bridges and structures of the Pennsylvania Railroad, Eastern Lines, has been appointed general storekeeper, with headquarters at Philadelphia, Pa. He was born at Pottsville, Pa., on January 9, 1866, was educated in the public schools of Pottsville and at Lehigh University and began railway work with the Pennsylvania Railroad on November 1, 1884, as a rodman on the Renovo division. He was promoted to assistant supervisor of the same division on January 1, 1886, and in August, 1890, was promoted to supervisor. On June 10, 1897, he was appointed supervisor on the Northern Central at Baltimore, and three years later was transferred to the Altoona yard. He was promoted to division engineer of the Monongahela division in January, 1901, and in June, 1903, was transferred to the Pittsburgh division. On April 1, 1907, he was appointed principal assistant engineer of the Western Pennsylvania division; in October, 1917, he was made assistant engineer, maintenance of way, in charge of bridges and structures of the road and served in that position until his recent appointment as general storekeeper of the Pennsylvania Railroad, Eastern Lines, as above noted.

George W. Snyder

OBITUARY

M. J. Greeney, track supervisor on the Lehigh Valley, with headquarters at Buffalo, N. Y., died on February 28, 1919, at the age of 55 years. Mr. Greeney was born at Reading, Pa., in June, 1864, and entered railway service with the Lehigh Valley as a water boy at White Haven, Pa., in 1880, from which position he was promoted finally to the office of roadmaster at Sayre in 1896. In 1899 he was appointed supervisor of track at Buffalo, which position he held until his death.

Frank F. Robb, formerly superintendent of the Pennsylvania Railroad, died on March 3, at his home in Philadelphia, Pa., at the age of 60. He began railway work in 1879, as a rodman on the Pennsylvania Railroad, at Altoona, and subsequently served successively as assistant supervisor, supervisor and assistant engineer. In June, 1893, he wa appointed superintendent of the Bedford division, and subsequently served in the same capacity on different divisions of the road, until December, 1903.

Carl Stradley, chief engineer of the Oregon Short Line, died of pneumonia on February 11, at Salt Lake City, Utah. He was born in Indiana, where he received his education, and later moved with his parents to Colorado, and in 1886 began railway service on construction surveys for the Union Pacific. In 1889-90 he was employed on surveys for the Pacific Short Line, between Lander, Wyo., and Ogden, Utah. In 1890 he was engaged in engineering work for the city of Ogden and later took up mining in Colorado, but returned to railroad service, becoming identified with new construction work on the Union Pacific. In 1901 he was engaged in location work for the Oregon Short Line, until appointed chief engineer, April 15, 1911, succeeding William Ashton, who resigned. Mr. Stradley was appointed assistant chief engineer of the Union Pacific System, including the Union Pacific, the St. Joe & Grand Island, and the Oregon Short Line when the government took over the railroads.

CONSTRUCTION NEWS

The Eastland, Wichita Falls & Gulf Railway Company has raised $156,000 to finance the first link in a railroad to be built through the oil fields of central west Texas. The first link of seven miles will be built between Eastland, Texas, and Mangum for the purpose of relieving existing traffic congestion in this district. The proposed road will afford a connecting link between the Texas & Pacific and the Missouri, Kansas & Texas.

The Oregon, California & Eastern is completing a 20-mile railroad from Klamath Falls, Ore., to Dairy, which will be the first link of a projected railway into Central Oregon. The new line will extend from Bend, Ore., to Silver Lake, at which point it will branch, one line running to Klamath Falls and the other line to Lake View, Ore. Another line will extend from Bend to Crane and will connect the Oregon Short Line at the latter point with the Oregon Trunk and the Oregon-Washington Railroad & Navigation Company at Bend. The new line will connect the Oregon Trunk and the Oregon-Washington Railroad & Navigation Company at Bend with the Southern Pacific at Klamath Falls and the Nevada, California & Oregon at Lake View. The company also plans to complete a seven-mile spur from Dairy, Ore., to Bonanza this fall, the farmers having agreed to furnish the grade and ties if the company will lay the steel and operate train service.

The Quebec Central Railway has awarded contracts for a car shop with concrete substructure and a brick and steel superstructure to be built at Newington, Que. It will be 75 ft. by 225 ft. and one story high and cost approximately $42,000.

TRACK MATERIALS

British India is in the market for 800,000 tons of rails, also splices, bolts and angles, to be delivered in 1919, 1920 and 1921, according to a cable received by the Canadian Trade Commission in Ottawa, from the Canadian Mission in London, with which it is in co-operation.

The director-general of military railways has a quantity of steel rails, with the necessary angle bars, bolts, tie plates, rail braces, frogs, switches and crossings for sale, one-third of which is stored at New York and the remainder at Norfolk, Va. Included in this material are 45,000 tons of 80-lb. A. R. A. type "B" rail, 11,800 kegs of track bolts, 210,140 pr. of angle bars, 249,390 tie plates and 109,000 rail braces for this rail, 4,000 kegs of track spikes, 5,750 low switch stands, 5,490 No. 8 turnouts, 387 single and double slip switches and 86 crossings of manganese steel construction.

FOREIGN RAILWAY NEWS

The Nyassaland Government is proposing to spend $4,000,000 on a new railway, to serve the country bordering on Lake Nyassa.

A new Peruvian railway project contemplates a line from Sayan, the present terminus of the Northwestern Railway of Peru, to the Checras coal field. This is to be a narrow-gauge line and preliminary plans are to be presented within one year.

American machinery in Australia is the subject of Circular No. 13, issued by the Bureau of Foreign Domestic Commerce, Far Eastern division. This gives information on the best method of handling business with Australia, methods of financing, character of equipment most desired, and statistics on imports of Australia during 1914, 1916 and 1917.

The English channel tunnel, to connect England with France, is again a subject of discussion. The plans now under consideration provide for the starting of the tunnel at some distance inside of both countries to avoid risk of falls of the cliffs such as have occurred recently. The estimated cost of the project is about $80,000,000 and it is thought that little difficulty will be had in securing the necessary funds.

The urgency of the need for American railway supplies in Mexico is emphasized by a cablegram sent by the American consul general in Mexico on February 21, announcing that a presidential decree which went into effect on February 20, 1919, permits the importation of switch points, iron and steel ties, turntables, iron and steel rails, frogs and tie plates into Mexico, free of duty for a period of six months. The duty remitted amounts to 68 cents per 100 lb.

The main Serbian railway, which runs from Belgrade through Nish to Salonika, is being rapidly repaired, according to a French wireless dispatch from Salonika. It is hoped that the first trains will be able to run between the northern frontier and Nish before the end of March. All the bridges and many miles of rail were destroyed by the Germans and the Bulgarians. The repair of the telegraph lines paralleling the railway is nearly completed.

The Government-General of Korea has authorized the establishment of a light railway starting at Masan and connecting with the Honam line at Songchyonli. A branch line will also run from Wanchom to Chonju, the capital of North Chonia Province. The main line measures 157 miles and the branch line 46 miles, making a total of 203 miles. The gauge of the railway will be 2 ft. 6 in., and the building expenses are estimated at 6,000,000 yen ($3,000,000). Construction will be started during autumn of 1919.

The Bagdad railway, since the elimination of the Turkish influence, promises to become an important railway project. The railway between Bozanti in the Taurus range and Aleppo is on the whole in first-class condition, although some of the tunnels will require lining within a short period to avoid serious difficulty. On the Amanus range the tunnel work has been finished, but there has been some trouble due to settling embankments. The track is laid and well ballasted for high-speed traffic. The line offers favorable agricultural possibilities and there are many mines in the Taurus region.

A project for a new railroad in Brazil in the state of Para has taken definite form in the nature of a concession granted to Antonio Amorin do Amaral for the construction of a railroad from Amapa on the north bank of the Amazon river not far from its mouth, to Oyapok on the Oyapok river at its mouth adjacent to the eastern foundary of French Guiana. The region covered by the concession is a strip of land 9.2 miles wide on either side of the line. It includes large areas of land suitable for cattle raising, immense forests and some gold mine territory.

The Greek government is in the market for 500,000 steel railway ties of 242 lb. weight each, according to an official announcement made by the Canadian Trade Commission, Ottawa. Canadian firms contemplating bidding, the announcement says, must take immediate action as the demand is urgent. American firms are known to be already in the field. The Trade Commission has reason to believe that this may give Dominion manufacturers a chance to use surplus steel and the forging presses which were installed for munitions making, possibly at better rates than their competitors.

Negotiations between China and Japan in September, 1918, granted to Japanese financiers the privilege of making loans in China for the building of railways in that country and to the government of Japan the right to participate in the operation of the railways now constructed in the Chantung province. This matter is now before the peace conference in France. It involves also the agreement of the Chinese government to recognize the treaty between Japan and Germany with respect to former German rights and interests in the Chantung province. The outcome of these international agreements will largely determine the extent to which railway activities will be in the hands of the Japanese.

The French Government, according to M. Claveille, minister of public works and transports, now intends to maintain the railway works which the Allies had carried out in French territory, under financial conditions which remain to be fixed. The minister also spoke of the work of restoring roads, of which it would be necessary to remake 65,000 miles, and waterways, on which 115 locks and 450 bridges have to be reconstructed, while 60 miles of canals have been entirely destroyed. He added that the Germans had delivered up to the middle of February between 36,000 and 37,000 freight cars and between 1,400 and 1,500 locomotives, or one-half of the material due to France.

Two railway projects in Spain under French and English domination are now under consideration. One of these provides for a line from Dax in southern France near the Bay of Biscay through Madrid to the Straits of Gibraltar. The other line extends from the French frontier to Vigo on the Atlantic coast of Spain just north of the northern boundary of Portugal. The principal object of this route is to develop Vigo as a port of entrance for American commerce. In addition to the lines mentioned above the bill in the Spanish legislature providing for these lines provides also for the expenditure of $100,000,000 in second tracking of existing railways. However, in consequence of the present financial condition of the Spanish government it is not anticipated that this bill will be passed without extensive curtailment.

PERSONNEL OF BOARDS ON SIBERIAN RAILWAYS

Complete lists of the members of the Inter-Allied Committee and the Technical and Military Boards, which have undertaken the rehabilitation of the Siberian Railway, were received by cable recently by the state department. The American members are Charles H. Smith, on the Inter-Allied Committee; John F. Stevens, president of the Technical Commission, and Colonel Hugh J. Gallagher, on the Military Board. The work will be mainly in charge of Mr. Stevens.

Following is the complete personnel of the committees:

Inter-Allied Committee, to supervise the railway system: Oustrougoff, Russia (chairman); Charles H. Smith, United States; Liou Tsin Jen, China; G. Bourgeois, acting for De Martel, France; Sir Charles Eliot, Great Britain; Consul General Gasco, Italy, and Matsudaira, Japan.

Technical board in charge of the technical and economic management of the railways: John F. Stevens, United States (president); Dr. Hama Tien You, China; Colonel Leverve, France; Colonel Jack, Great Britain; Major Garibaldi, Italy; H. Nabso, Japan, and Danielevsky, Russia.

Military board, to co-ordinate transportation matters concerning military forces of the United States, the Allies and Russia: Lieutenant Kia Tsien Chich, China; Colonel Tessier, France; Colonel Jack, Great Britain; Captain Schonrolli, Italy; General Takeuchi, Japan; Major Vladimiroff, Russia, and Colonel Hugh J. Gallagher, United States.

SUPPLY TRADE NEWS

GENERAL

The Kalamazoo Railway Supply Company, Kalamazoo, Mich., has recently let a contract for the erection of an addition to its plant at Kalamazoo. The building will be of brick, 50 ft. by 135 ft., with a saw tooth roof, and will cost approximately $10,000.

The Air Reduction Company, Inc., held a directors' meeting on February 19, 1919, at which **A. S. Blagden** was elected president; **A. R. Ludlow,** vice-president (previously announced); **C. E. Adams,** treasurer; **M. W. Randall,** secretary; **C. L. Snow,** assistant treasurer, and **C. C. Emerson,** assistant secretary.

The LaSalle Portland Cement Company plant, LaSalle, Ill., formerly the German-American Portland Cement Works, was sold on March 11 by representatives of A. Mitchell Palmer, alien property custodian. The controlling interest in the stock was bid in by a group of cement manufacturers headed by A. C. Dustin of the Sandusky Cement Company of Cleveland, O.

PERSONAL

W. S. Moore, formerly with the **Cleveland Frog & Crossing Company,** Cleveland, Ohio, has been appointed assistant to the president and general manager of the Greenville Gravel Company, with headquarters at Greenville, Ohio.

J. I. Edwards has been appointed manager of the Rock Drill Sales division of the Chicago Pneumatic Tool Company, succeeding **E. Eklund,** who has been appointed special foreign representative, and who will leave shortly for Europe in the interest of that company.

J. A. Farris, who has been connected with the **Whiting Foundry and Equipment Company,** at Chicago, as crane engineer in the engineering department for the past ten years, has entered the employment of **Scully-Jones & Co.,** at Chicago, as special sales engineer on cranes.

The Deeming-Endsley Company has been organized with headquarters in the Transportation Building, Chicago, with Horace F. Endsley, president, Herbert Deeming, vice-president and general manager, and H. M. Barney, secretary and treasurer. The board of directors is composed of Horace F. Endsley, Herbert Deeming, D. D. Glass, H. M. Barney, O. P. Morrison, A. L. Knowles and Eugene Landers. The new company will handle the Morrison Switchpoint Holddown and other railroad devices.

Herbert Deeming

Mr. Deeming was born in England on April 16, 1880, and began his business career as a stenographer and clerk in the general passenger department of the Freemont, Elkhorn & Missouri Valley at Omaha, Neb., in October, 1897. From July, 1899, to September he was with the American Express Company at Omaha, and from that time until January, 1900, he was employed in the general superintendent's office of the Freemont, Elkhorn & Missouri Valley. Later he was promoted to secretary to the general freight agent and in July, 1902, went to Chicago, where he was employed in the audi-

tor's office of the Chicago & Western Indiana. From July, 1903, to February, 1916, he was secretary of the General Managers' Association at Chicago and from November, 1907, to February, 1916, was secretary also of the Association of Western Railways. In March, 1916, he became assistant director of the Railway Educational Bureau at Omaha, Neb., and seven months later he became associated with H. E. Reisman Advertising Company, going later with Mudge & Co. as sales manager, which position he held until the Deeming-Endsley Company was incorporated.

W. B. Gibson, manager of the mining machinery department of the Allis-Chalmers Company, of Milwaukee, Wis., has been appointed manager of the small tank department, of the **Wm. Graver Tank Works,** with headquarters at Chicago, and **R. C. Huntington,** manager of sales promotion of the Fuller Rubber Company, Hampton, Ohio, has been placed in charge of department of sales, promotion and advertising of the Graver Company.

PERSONNEL CHANGES OF MUDGE & CO.

Lieutenant Sherman C. Amsden has been appointed assistant to the president of Mudge & Co., Chicago, in which position he has charge of publicity, special sales plans, and investigations. Mr. Amsden was born at Manchester, Mich., in 1889 and was educated in the public schools of that city and the high schools of Brooklyn, N. Y., and Detroit, Mich. He entered the service of the Atchison, Topeka & Santa Fe as chief clerk to the division freight agent at Topeka, Kan., later becoming assistant editor of the employees' magazine of the Chicago, Rock Island & Pacific at Chicago. Mr. Amsden entered the employ of Mudge & Co. in 1914 and on November 1, 1917, enlisted in the air service, receiving his commission as lieutenant on July 1, 1918. Upon his honorable release he returned to Mudge & Co. to become assistant to the president.

Lieut. Sherman C. Amsden

Jean K. Vanatta, mechanical engineer of Mudge & Co., at Chicago, has been appointed service manager, in which capacity he will have charge of the company's service engineers, who are working with the motor car men on the various railroads as well as developing the service idea. Mr. Vanatta was born at Colorado Springs, Colo., on June 2, 1888, and graduated from the University of California in 1910. He began his business career immediately after as special apprentice of the Washington Air Brake & Machine Company. During 1914 he was supervisor of the engineering and development work for the Great Western Mining & Milling Company, with headquarters at Hayman, Colo., and the following year was employed by the Bell Telephone Company on outside construction work. In September, 1916, Mr. Vanatta entered the employ of Mudge & Co. as shop and material inspector, which position he held until his recent promotion.

Jean K. Vanatta.

Clyde P. Benning, service manager of Mudge & Co., Chicago, has been promoted to assistant general manager with headquarters at Chicago, in which position he will assist the railroad companies in developing motor car organizations. Mr. Benning was born at Atchison, Kan., on September 20, 1888. He entered the employ of the Missouri Pacific in 1903 as a clerk and held several clerical positions in that company's organization until April, 1905, when he became a machinist apprentice on that road. In 1910 he left the Missouri Pacific to take a position with the Tool & Railway Specialty Company at Atchison, Kan., with which concern he remained until December 15, 1914, when he resigned to enter the service of Mudge & Co. as a shop inspector. Previous to his recent appointment as assistant general manager, Mr. Benning was service engineer and in 1916 western manager, with headquarters at San Francisco, Cal., and during the latter part of 1918 held the position as service manager, as noted above.

Clyde P. Benning

H. H. Simmons, who has been associated with the Simmons-Boardman publications for the last 10 years, more recently as business manager of the *Railway Maintenance Engineer,* has severed his connection with the publication to become associated with John H. Cross in the advertising service business under the firm name of Cross & Simmons, Inc., with offices in the Webster building, Chicago. Mr. Simmons was born at St. Joseph, Ill., on November 14, 1888. He attended the University of Illinois, graduating in civil engineering in 1909, and immediately joining the staff of the Simmons-Boardman Publishing Company. He was first employed as associate editor on news in the Chicago office. Later he was made assistant engineering editor of the Railway Age and the "Maintenance of Way Edition," published in the third issue of each month, this being the predecessor of the present *Railway Maintenance Engineer.* In May, 1915, he was appointed editor of the Railway Signal Engineer and continued in active charge of the editorial work of that publication until November, 1917, when he was transferred to the business department of the Simmons-Boardman Publishing Company in the capacity of business manager of the *Railway Maintenance Engineer,* which position he held until his recent resignation.

H. H. Simmons

H. A. Jackson, president of the Chicago Pneumatic Tool Company, Chicago, returned February 19, from England, where he has been inspecting the foreign plants of the corporation. The Consolidated Pneumatic Tool Company, Ltd., and the Pneumatic Tool Company (respectively the selling

agency and the manufacturing corporations), subsidiaries of the Chicago Pneumatic Tool Company in England, were found to be in excellent condition. During the war the company has made some profit manufacturing bayonets for the British government while carrying on its regular tool business to capacity. News of the disposition of the International Compressed Air & Electric Company of Berlin, Germany, which the Chicago Pneumatic Tool Company owns, has not yet been received, although Mr. Jackson has been striving for a year to get word of this property.

H. H. Morgan, who has been connected with the Chicago office of the **Robert W. Hunt & Co.** for 15 years as head of the cement department and physical laboratory, has been transferred to the Pittsburgh office as assistant to **D. W. McNaugher**, who is the Pittsburgh partner of the company.

Edwin Besuden has been appointed eastern district manager of the railway department of the Chicago Varnish Company, in charge of steam and electric railway sales. His headquarters are at 50 Church street, New York. Mr. Besuden was formerly sales manager of the Jewett Car Company and was connected with that company for 16 years.

Fred H. Waldron, Minneapolis representative of the Chicago Pneumatic Tool Company, has been appointed manager of the Pneumatic Tool Sales division, to succeed **J. D. Osgood**, who has resigned. **Nelson B. Gadch** has been appointed district manager of sales with headquarters in the Metropolitan Bank building, Minneapolis, Minn.

C. F. Massey, president of the Massey Concrete Products Corporation, Chicago, has been appointed chairman of the board of directors of that company and **J. S. Hobson**, western manager of the Union Switch & Signal Company at Chicago, has been appointed president of the Massey Concrete Products Corporation to succeed Mr. Massey. Mr. Hobson still retains his position with the Union Switch & Signal Company.

TRADE PUBLICATIONS

Railroad Ditcher.—The Osgood Company, Marion, Ohio, has issued an eight-page folder describing the "Osgood 18" railroad ditcher. The information is presented in the form of a descriptive article illustrated by halftones and line drawings.

Reclaiming Railroad Frogs.—The Air Reduction Sales Company, New York, has issued a 24-page booklet illustrating and describing the process of reclaiming railroad frogs by the oxy-acetylene process. The process is described in detail with diagrams and photographs and considerable cost data and material and service records are also given.

Manganese Products.—The Indianapolis Switch & Frog Company, Springfield, Ohio, has issued a 12-page leaflet of information on its products, including solid cast manganese frogs for turnouts and crossings and the solid manganese crossings. A page each is also devoted to Eymon continuous crossings and the Balkwill articulated cast manganese crossing.

Switch-Point Hold Down.—The Deeming-Endsley Company, Chicago, has issued a 12-page folder describing the results secured with a device manufactured by that company for safeguarding a switch against the tendency for the switch points to "cock up." It is illustrated with photographs of actual installations.

Cranes.—The Whiting Foundry Equipment Company, Harvey, Ill., has issued an illustrated catalogue No. 135, superseding catalogue No. 127, giving general descriptions of their line of electric, pneumatic and hand power traveling cranes and pillar cranes, as well as such details as cabs, trucks, brakes and electric equipment.

Wrenches.—The Coes Wrench Company, Worcester, Mass., has issued a 14-page illustrated catalogue dealing with the line of screw wrenches and accessories made by this company. Information is given regarding their construction, manufacture and strength compared with other wrenches according to tests conducted at the Harvard University testing laboratory.

Graphite Products.—The Joseph Dixon Crucible Company, Jersey City, N. J., has issued a new pocket catalogue covering a variety of products handled by this concern. Several pages are devoted to lists of articles for special use in mills, on railroads, automobiles, etc. These lists being intended for reference to various subjects for which special pamphlets will be supplied.

Blaw Forms.—The Blaw-Knox Company, Pittsburgh, Pa., has issued a 24-page booklet describing and illustrating the forms manufactured by that company for use in building curbs, gutters, concrete pavements and sidewalks. Special designs are shown for each purpose named and illustrations show the adaptation of this equipment to different pieces of actual construction.

The Insley Idea.—The Insley Manufacturing Company, Indianapolis, Ind., has just issued the first number of a bimonthly publication of eight 9-in. by 12-in. pages devoted to the interests of construction work on which Insley equipment is applicable, and for the assistance of contractors, industrial plants and other users or prospective users of Insley equipment.

Lakewood Clam Shells.—The Lakewood Engineering Company, Cleveland, Ohio, has published Bulletin *26*, containing 24 pages illustrative and descriptive of the Lakewood clam shell buckets. The first part of the book is devoted to illustrations showing the variety of the applications that have been made, followed by several pages of drawings and tables showing the principal dimensions, etc., of these buckets. Two pages illustrate and list various classes of construction equipment manufactured by this company.

Lighting.—The National X-Ray Reflector Company, New York, has issued a 246-page book, 8 in. by 10 in., bound in cloth, which is an exposition of the manner of lighting all kinds of interiors by the use of the X-Ray reflectors. This matter is divided into chapters dealing with such subjects as illumination from concealed sources, control of light, indirect lighting, direct lighting, etc., in each case presenting, first, the general principles of illumination involved and then showing the special application of the X-Ray equipment. A considerable portion of the book is devoted to descriptions of a large number of actual installations.

Saw Mill Machinery.—The American Saw Mill Machinery Company, New York, has issued a 48-page book illustrating and describing the use of the various classes of saws and wood working machinery manufactured by this company, with special applications to its use on war work. This includes the construction of the cantonments, hospitals, docks, etc., shipbuilding and the forestry operations carried on by American troops in the forests of France. A large number of full-page photographs add to the interest, while special attention has been given to the publication of testimonials supplied by contractors and others.

Railway development in Ecuador, according to a recent bulletin of the Bureau of Foreign and Domestic Commerce, includes active construction on four railways which are to be completed in the near future. One of these extends from Guayaquil to Salinas, with a branch from Amems to Playas. More than two-thirds of this line has been finished. All explosives and tools used are purchased in the United States. The Quito-Esmeraldas Railway extends north from Quito, eventually to reach Tulcan, then west to Esmeraldas; about 20 miles of the roadbed have been finished, including many concrete bridges and culverts. It is a government work. The Ambato-Curaray Railway starts at Ambato, the eastern terminal to be at Curaray on the eastern side of the Andes mountains. It is completed to Pelileo, about 30 miles, and is in operation. All materials used were purchased in the United States, and it is being built by American engineers. The Babahoyo Railway is to extend toward Quito. The grading for some 15 miles is finished.